INDIRECT HEALTH CONSEQUENCES OF WAR

by

Daniel Harold Poole

A dissertation submitted to the faculty of
The University of Utah
in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

Department of Sociology

The University of Utah

December 2016

The University of Utah Graduate School

STATEMENT OF DISSERTATION APPROVAL

The dissertation of **Daniel Harold Poole**

has been approved by the following supervisory committee members:

Brett Clark	, Chair	**5/13/16** Date Approved
Ming Wen	, Co-Chair	**5/13/16** Date Approved
Theresa A. Martinez	, Member	**5/13/16** Date Approved
Jeffrey D. Kentor	, Member	**5/13/16** Date Approved
Andrew Kent Jorgenson	, Member	**5/13/16** Date Approved
Craig Bryan	**,** Member	**6/1/16** **.**

and by **Ming Wen** , Chair/Dean of

the Department/College/School of **Sociology**

and by David B. Kieda, Dean of The Graduate School.

ABSTRACT

This dissertation aspires to create a better understanding of the real human costs of war. I seek to uncover the relationship between armed conflict and indirect health effects of armed conflict. There is a lot of attention paid to direct consequences of war, including casualty counts, direct destruction of infrastructure, and impacts on economies. This dissertation aims to dig further into the impact of armed conflict by focusing on the relationship between war and chronic and infectious diseases. In particular, I explore cardiovascular disease mortality to reflect chronic disease and cholera outbreak to represent infectious disease. These are examples of indirect health consequences of war that have been understudied in social science research. The depletion of resources, lack of access to health care, and general disruption to everyday life during times of armed conflict create excess stress and burdens, which increase morbidity and mortality. I use a variety of data to measure demographic, developmental, and conflict-related outcomes. Armed conflict has also been shown to exacerbate the occurrence and impact of infectious diseases such as cholera. The recent war in Iraq is used as a case study to explore mechanisms that resulted in a significant increase of cholera-related morbidity and mortality in that country. I find that armed conflict increases cardiovascular disease mortality rates across countries and over time, as well as incidence of infectious disease outbreak. Limitations of data are discussed as well as recommendations for future research.

This dissertation is dedicated to all those
who have experienced the pain of war.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

I wish to thank my committee members for their patience, insight, and guidance. Ming, Andrew, Jeff, Craig, and Theresa have all been uniquely influential along my academic journey. The chair of the committee, Brett Clark, was integral in helping me cross the finish line. I also wish to thank Matt Smith-Lahrman for introducing me to and inspiring my love of sociology. Most importantly, I wish to acknowledge my beautiful partner, Heidi. This project would never have been completed without her support.

CHAPTER I

INDIRECT HEALTH CONSEQUENCES OF ARMED CONFLICT

Introduction

Few human actions have as dramatic an influence on all spheres of social reality as that of armed conflict. Social scientists have begun to realize the importance and ultimately the necessity of studying war. Sociological research regarding the relationship between war and health remains sparse at best. Nevertheless, insightful work is being conducted to increase our understanding of how war affects the health of populations. An important development in this area of research is the recognition that armed conflict creates both direct and indirect health problems for both military personnel and civilians. During a historical period when global inequality continues to result in and emerge as an effect of armed conflict, it is necessary to advance the sociological investigation of war and health.

This dissertation directly contributes to this emerging field of study, by examining how armed conflict influences infectious and chronic diseases among civilians within less-developed nations. In this chapter, I provide an overview of the sociological theorization and research on war and health. I begin with a general discussion of armed conflict and health-related outcomes, focusing on specific health outcomes. Given the

focus of my research, I highlight the indirect health effects of war, in particular how armed conflict influences infectious and chronic diseases. I conclude this chapter by describing gaps in the literature that need to be explored and how my dissertation helps address these issues.

Armed Conflict

The Uppsala Conflict Data Program at the Department of Peace and Conflict Research, at Uppsala University, defines war as "a contested incompatibility that concerns government and/or territory where the use of armed forces between two parties, of which at least one is the government or state, results in at least 25 battle-related deaths" (Gleditsch et al. 2002: 3). The terms "war" and "armed conflict" are used interchangeably in the literature and will be in this dissertation as well.

The characteristics of how war is fought have changed. Following World War II, the majority of armed conflicts have occurred within rather than between states (Bunton and Wills 2005). The current War on Terror is demonstrative of the urban warfare that has become the most common form of armed conflict in the last several decades. This type of conflict is characterized by insurgent tactics typically employed in densely populated areas. Gone are the days when large formal armies gathered in remote fields to face off in Napoleonic battle. These contemporary methods of armed conflict directly impact not only military personnel, but also civilians in the contested area in a number of ways. Additionally, modern warfare increased the importance of considering the indirect health outcomes resulting from armed conflict.

The distinction between members of the military and civilians has become blurred

as a result of the recently emerged trends in armed conflict. In fact, U.S.-led wars in Iraq and Afghanistan have shown that civilians can become combatants and then return to their civilian roles on a regular basis. Further complicating matters, civilians, health care workers, and public infrastructure are often targeted in contemporary armed conflicts. The expanded front of war highlights the importance of research addressing war-related health outcomes of entire populations rather than just focusing on military casualties, which has been the historical focus of the relationship between war and health. Given the dynamics of an integrated international system and widespread conflict, a global perspective is also necessary. Less-developed nations often spend more on guns than health and education, purchasing almost 85 percent of the weapons sold on the global market (Levy and Sidel 2003). The distinctions within the world are all the more important when considering that the United States, China, Russia, France, and the United Kingdom produce 90 percent of the arms sold on the global market. Structured global inequality is demonstrated by the direction that the arms flow and also the locations where wars are fought. As a result, the most vulnerable populations in the world must contend with both poverty and war.

Health Outcomes

Sociological research has demonstrated that the stresses of armed conflict on military and civilian populations causes a depleted state of well-being that results in an overall increase in morbidity and mortality. To make matters worse, armed conflict damages infrastructure and limits health care access and delivery, further undermining the well-being of the population. In 1990, armed conflict was the sixteenth cause of

Global Burden of Disease. It is expected to surpass HIV/AIDS and to become the eighth leading cause by 2020 (Murray and Lopez 1997).

Women and children tend to suffer disproportionately as a result of armed conflict. Child mortality rates have been shown to increase more than two-fold during even short periods of conflict, such as the 1991 Gulf War in Iraq (Carlton-Ford 2004). Children under the age of five experience higher rates of mortality as a result of war than most other age groups. With the technological advancement of weaponry since World War II, civilian wartime casualties have increased from 10 to 90 percent (Levy and Sidel 2000).

The differences between men and women are important to consider. Women bear more of the indirect brunt than men. However, men tend to experience greater morbidity and mortality as a direct result of conflict, which generally increases the burden of women who are left to care for children, other members of the household, and themselves. These women also are left with added economic, political, and social responsibility. Specific causal mechanisms and consequences explored in the literature will be addressed below.

Jansen (2006) adds that gender inequality experienced by women is magnified by armed conflict. The author states that women suffer disproportionately in terms of human rights, access to resources, and personal safety. It stands to reason that women experience higher rates of long-term negative effects because they live long enough to experience them. Many of the men who potentially could have died from cardiovascular disease later in life, indirectly related to previous conflict, are likely to have died before the disease was able to cause death.

Indirect Health Consequences

It is important to distinguish between direct and indirect health consequences, especially since this dissertation will focus on the latter. The direct effects of war include bullets, bombs, and other weaponry causing direct injury or death. Indirect effects include the destruction of physical infrastructure, depletion of public utilities and health care systems, decreases in doctors and health care workers, and limited access to medical supplies, food, and clean water. Until fairly recently, there have been few studies that examined the indirect health consequences of war. The studies that do exist focus mainly on mental health issues such as posttraumatic stress disorder and depression (Carlton-Ford, Ender, and Tabatabai 2008; Levy and Sidel 2009). The indirect health consequences of war have not been researched in great detail despite the fact that they play a significant role in morbidity and mortality across the globe. Nonetheless, it is recognized that war-related injury and deaths are a large contributor to disease on a global scale (Murray et al. 2002). A full account of the health implications of war has been difficult to document, in part due to armed conflict itself. During these periods of conflict, information systems are often broken down, making it difficult to understand the full magnitude of death and disability experienced in a population.

A significant limitation of the literature is that very few studies have conducted longitudinal, cross-national research to determine the legacy of war, particularly in regard to health outcomes. One exception is an article written by Li and Wen (2005), which explored the impact of armed conflict on adult mortality across countries and over time. The authors constructed age-sex-cause specific death rates using national statistical registries and population counts obtained from the World Health Organization. They used

several measures of armed conflict to explore the effects of various types of conflict on adult mortality rates. Their results demonstrated that males bear more of the immediate brunt following conflict, whereas females suffer increased mortality rates as a lingering effect of conflict.

Another foundational piece within the literature is a study that explored the impacts of civil war on civilian populations (Ghobarah, Huth, and Russett 2003). This study also used World Health Organization data to explore death and disability among populations that had experienced internal armed conflict. The authors focus on the long-term impacts and examine a variety of debilitating diseases and conditions that emerge as indirect consequences of civil war. In their conclusions, they make the comparison that suggests the amount of death and disability experienced in the year 1999, because of lingering effects of war, is equal to that experienced as a direct result of war during the years 1991-1997. In other words, there was an equivalent amount of death and disability in one year as a result of indirect effects, as compared to the amount of death and disability caused by direct effects during a period of seven years.

Other studies have explored the effects of limited access to food and supplies as a result of war. Such studies have shown that child malnutrition rates are quickly increased as a result of armed conflict (Carlton-Ford 2004). Cardiovascular disease has also been shown to be linked to the stresses experienced in war (Fitzpatrick et al. 2004; Poole 2012). War also disrupts communities, undermining the resources that support well-being. For example, in nations experiencing armed conflict, educated individuals often leave, contributing to a "brain drain." Often times, the most educated individuals, such as doctors, in a society are those who have the resources necessary to leave a conflict zone.

They have connections outside of their home area that can provide them with a destination in times of crisis. Those with less education and ultimately less resources are often unable to flee their home when war reaches their doorstep (Docquier, Lohest, and Marfouk 2007). All of these factors can have devastating effects on the overall health and well-being of civilian populations.

Research has shown that from 2003–2011, during the Iraq War, medical staff experienced an excess amount of burden. They were targeted by combatants for kidnapping and extortion, as well as killed (Zarocostas 2007). Many medical doctors and health care workers fled the country. Reports claimed that as many as 2,000 doctors had been killed and 2 million individuals had fled the country (Zarcostas 2007). The Brookings Institution has reported that there were 34,000 registered doctors before the invasion in Iraq (Cockburn 2008). Within the first four years after the invasion, 250 had been kidnapped, 2,000 had died, and 20,000 had left the country. The loss of medical personnel only exacerbates the overall decline in health conditions. In a November 11, 2006, *Los Angeles Times* article, Joseph Chamie, former director of the U.N. Population Division and an Iraq specialist, claimed that the health of Iraq's population had deteriorated to a level not experienced since the 1950s (Kramer 2007).

Being subjected to armed conflict can also increase the levels of risk behaviors engaged in by populations. People who are exposed to armed conflict may engage in risky behavior in order to cope with the stress experienced both during and after the conflict. Studies have shown that risk factors such as smoking, obesity, and hypertension were disproportionately high among both men and women during and after periods of armed conflict (Pilay et al. 2007).

Infectious Disease

Within social science, there is a fairly small body of research that looks at the impact of conflicts on infectious diseases (Bunton and Wills 2005; Cliff and Noormahomed 1993b; Garfield 1985; Iacopino and Waldman 1999; Murray et al. 2002). Cholera and malaria appear most often in studies exploring the relationship between infectious diseases and war (Smallman-Raynor and Cliff 2000). During times of conflict when resource supplies are limited and/or cut off, and clinics become short staffed or unavailable, infectious diseases such as cholera can quickly create serious problems. This is especially true when large numbers of individuals are displaced and relocated into refugee camps where there is often limited access to clean water and sanitation services and very high population density. These conditions create the perfect environment for the rapid spread of infectious diseases.

Infectious disease becomes apparent much more quickly than chronic disease. Infectious disease outbreaks can be accounted for by exposure to contaminated food and water, contact with poor hygiene conditions, and dense populations living in close proximity to each other. All of these factors can be exacerbated during times of armed conflict. Individuals often migrate to other areas when violent conflict emerges in their neighborhoods. This can lead to refugee settlements and other temporary living conditions that may or may not provide clean water and waste disposal systems. This can cause an increase in exposure to pathogens causing infectious disease. Many infectious diseases are relatively easy to treat. Cholera, for example, can be successfully treated in many cases with simple hydration efforts. If war has caused a disruption to medicine and clean water, these otherwise easily treated diseases can become lethal and widespread.

Infectious diseases tend to emerge rapidly and also to be resolved relatively quickly as well. A person infected with cholera has a high rate of survival if basic treatment is available. While previous occurrence of the disease may exacerbate future infections, a person is likely to recover and not experience further negative health outcomes. This marks a clear distinction between infectious and chronic diseases.

Chronic Illness

Morbidity and mortality among the working-age population creates the most deleterious effects on society as this population supports both younger and older generations. Chronic illnesses are negatively influenced by stress and other long-term exposure to hazardous social contexts (Fitzpatrick et al. 2004; Head et al. 2008; Kang, Bullman, and Taylor 2006). Many chronic diseases may not present themselves until years or decades after conflicts have ended. Increases in chronic illness such as cardiovascular disease can negatively impact working-age populations, which in turn creates additional economic and social burdens on entire nations, but especially women and children.

The majority of studies exploring chronic disease and war focus on cardiovascular disease. Examples include studies of heart disease mortality associated with veterans who experienced amputations (Rose et al. 1987), as well as increased rates of cardiovascular disease among veterans in general (Falger et al. 1992) and specifically as a result of increased rates of posttraumatic stress disorder (Kang, Bullman, and Taylor 2006). Increased levels of stress are known to weaken the heart and increase the likelihood of cardiovascular ailments. Chronic heart disease has also been shown to develop as a result

of increased rates of anxiety for several reasons (Kubzanksy et al. 1998). These include risky health behaviors, increased hypertension, and an increased chance of triggering deadly coronary failures.

Military personnel are not the only people at risk for increased heart-related morbidity and mortality as a result of being exposed to armed conflict. Head et al. (2008) used birth weight data and late life hospital admissions for cardiovascular disease to examine the effect of under-nutrition in infancy on later life cardiovascular disease. The data measuring birth weight were timed to coincide with the German occupation of the Channel Islands during World War II. A control group of individuals born at the same time, and who had been evacuated or otherwise left the area, were also used in the study. The authors found that the prevalence of cardiovascular disease was correlated with exposure to the occupation. The lack of proper nutrition during the occupation was cited as a major factor. The impact of food deprivation during the occupation had a stronger impact on cardiovascular disease prevalence among all age groups than undernourishment *in utero* before the war.

Conflict type also plays an important role in the health outcomes experienced by populations. It is logical that as the severity of the conflict increases, the mortality and adverse health consequences related to the conflict also increase. The duration of war will obviously also play an important role in the severity of both direct and indirect health consequences. Internal conflict, or civil war, can be especially devastating on populations. Because most, if not all, of the fighting occurs within a given territory, the local populations bear much of the brunt of the conflict. Studies have shown that civil wars produce devastating effects on civilian populations because of exposure to

conditions that increase the possibility of injury, disease, and death (see Ghobarah, Huth, and Russett 2003).

Sexual Violence

Gender inequality experienced by women is magnified by armed conflict. Women suffer disproportionately in terms of human rights, access to resources, and personal safety (Jansen 2006). Rape has often been used as a weapon against civilian targets. It is an effective tool of destruction as it demoralizes individuals and has been found to undermine community bonds (Swiss and Giller 1993). This cruel tactic is also responsible for an increase of sexually transmitted diseases, unwanted pregnancies, and damage to women's reproductive health (Ashford and Huet-Vaughn 2000; Swiss and Giller 1993; UNCF 2004). In 2001, the UN Security Council understood the need for action with regard to responding to sexual violence in the context of war. The Council passed Resolution 1325, which demanded that participants in armed conflict seek to "protect women and girls from gender-based violence, particularly rape and sexual violence" (Bunton and Wills 2005:80).

An important limitation of this literature is that it is sparse and sporadic. As previously mentioned, there are few sociological studies that explore the indirect health consequences of armed conflict. There are even fewer that focus on chronic or infectious diseases. Of the studies that do exist, only Li and Wen (2005) and Poole (2012) employed time-series and cross-national designs, allowing for broad applicability and generalizability. This is a significant gap in the literature with regard to broad cross-national studies as opposed to descriptive narratives. This dissertation helps contribute to

the literature by addressing that gap.

Considerations for Future Research

During times of conflict, it becomes more difficult to keep records and to accurately account for death and disease. Data that do exist are not likely to capture the full extent of what happens during devastating events. It is also difficult to parse out the exact causes of particular health outcomes occurring years down the road. Further research is needed in order to better understand all of the mechanisms associated with war related health outcomes. Further research should also investigate the effects of a wide variety of chronic and infectious diseases that have not been explored in any detail by social scientists in order to paint a more comprehensive picture and formulate better understanding of the relationship between war and health.

Specifically, further research should directly explore ways in which armed conflict influences disease outbreak and occurrence. For example, additional insight may be gained by examining specific conflicts in order to understand the mechanisms that affect rates of morbidity and mortality. If we are able to better understand the mechanisms such as depleted resources and damaged infrastructure that cause increases in disease, disability, and death, many lives could be improved and saved. Policy makers, citizens, and leaders who make the critical decisions of when to engage in armed conflict, when to exit, and how to cope with the aftermath need to be as informed and educated as possible regarding the potential outcomes and ultimately the human costs of war.

In order to move forward, new data will need to be collected in order to fully understand the relationship between armed conflict and health. The limited data that are

currently available typically only extend through the Cold War period (see Gleditsch et al. 2002 and Lacina and Gleditsch 2005). As the Global War on Terror stretches into its second decade, it will be important for researchers to construct comprehensive databases that will allow the study of wars in the Middle East, eastern Africa, and elsewhere. Technological advances are making data accumulation, storage, and distribution more widely available, accessible, and creditable. Innovative and creative ways of measuring infrastructure depletion, information system break downs, population movement, and health outcomes will be required to better understand the causal mechanisms of war on health outcomes. It will be important to examine the long-term effects of conflict on mortality and morbidity after years have passed and data become available.

Collaboration between public health experts, political scientists, and sociologists will be necessary in order to achieve a comprehensive understanding of the causes and consequences of armed conflict in relation to the health of populations. This comprehensive approach should also include an analysis of the intensity and duration of each conflict as well as varying types of conflict such as civil wars, wars fought between nations on foreign soil and within their own boarders, surrogate wars fueled by outside actors and conducted on foreign soil, and so forth. The future of social scientific studies of war and health is very promising. Many questions remained unanswered but research agendas in this field of study are gaining momentum.

My Research and Chapter Outlines

Social scientific research has shown that violent conflict can quickly lead to a dismantled infrastructure, depleted health care system, damaged economy, and dwindling

population stability. All of these socio-economic components contribute directly and indirectly to the health of populations. When any of these components are disrupted, depleted states of well-being are inevitable. The societal disruption created by armed conflict often reaches levels of intensity that result in severe consequences such as increased morbidity and mortality. War is a complicated topic with many disturbing outcomes. The effects of extreme violence such as war can be very far-reaching, often having severe indirect consequences. We typically think of direct health consequences such as soldier and civilian casualties caused by bullets and bombs. There are, however, numerous indirect health consequences that create extensive devastation among populations (see Ghobarah, Huth, and Russett 2003; Murray et al. 2002). Because many of these indirect effects only become evident over time, policy makers and those who have the most control over initiating the violent acts often do not take these factors into consideration. As our world continues to remain stratified and armed conflict is common, it is extremely important for social scientists to continue exploring the real human costs of war.

An important limitation of the literature is that it is sparse and sporadic. As previously mentioned, there are few studies that explore the indirect health consequences of armed conflict. There are even fewer that focus on chronic or infectious diseases. Of the studies that do exist, I am aware only of Li and Wen's (2005) work that has a time-series and cross-national design allowing for broad applicability and generalizability. This is a key factor as to why studies such as this one provide an important contribution to the literature and field in general.

This dissertation seeks to address the broad research question of, what are the

indirect health effects of armed conflict? In particular, I examine the effect that armed conflict has on both chronic and infectious disease outbreak and consequence in order to better understand the human consequences of war. Representative health ailments used to explore these relationships include cardiovascular disease mortality and cholera outbreak. In the chapter that follows, I begin by exploring the relationship between armed conflict and male and female cardiovascular disease mortality across country and over time. Limitations of this macro, quantitative exploration are then supplemented with a case study. In the next chapter, I conduct a case study that examines a cholera outbreak that occurred in Iraq following the 2003 invasion of the country. Both of these studies explore structural relationships between macro forces such as political and economic realities including armed conflict and the implications these factors have on individual health outcomes.

CHAPTER II

INDIRECT HEALTH CONSEQUENCES OF WAR: CARDIOVASCULAR DISEASE

Introduction

War is a complicated topic with many disturbing outcomes. The effects of extreme violence such as war can be very far-reaching, often having severe indirect consequences. We typically think of direct health consequences such as soldier and civilian casualties caused by bullets and bombs. There are, however, numerous indirect health consequences that create extensive devastation among populations (Ghobarah, Huth, and Russett 2003; Murray et al. 2002). Because many of these indirect effects only become evident over time, policy makers and those who have the most control over initiating the violent acts often do not take these factors into consideration. As our world continues to remain stratified and extreme violence is common, it is extremely important to explore what the real human cost of war is.

In this chapter, I focus on rates of mortality caused by cardiovascular disease (CVD). The main purpose of this study is to examine the long-term effects of war on mortality of populations in a time-series and cross-national design. Men and women experience mortality differently with women typically enjoying longer life expectancy across the entire life course (Jansen 2006; Mathers et al. 2001). I conduct a gender-

stratified analysis of indirect effects of war on CVD mortality rates. Cardiovascular diseases are chronic illnesses that are negatively influenced by stress and other long-term exposure to hazardous social contexts (Fitzpatrick et al. 2004; Head et al. 2008; Kang, Bullman, and Taylor 2006). Many chronic diseases may not present themselves until years or decades after conflicts have ended. In this paper, I use the definition of war developed by the Uppsala Conflict Data Program at the Department of Peace and Conflict Research at Uppsala University (UCDP) (Gleditsch et al. 2002). The UCDP defines war as "a contested incompatibility that concerns government and/or territory where the use of armed forces between two parties, of which at least one is the government or state, results in at least 25 battle-related deaths" (Gleditsch et al: 3). I explore what I have labeled as minor conflict, defined as at least 25 battle-related deaths and also severe conflict, which is defined as at least 1,000 battle-related deaths.

Research Questions and Hypotheses

This chapter examines the effects of war on mortality rates associated with cardiovascular diseases and how these associations vary according to sex. The study hypotheses are: 1) War will cause chronic disease mortality rates to increase. 2) The severity, length, and type of conflict will influence mortality rates. 3) Increases in severity and length will increase mortality rates. 4) Interstate conflict will have less influence on mortality rates. 5) Internal conflict will have a greater impact on mortality. 6) Minor conflict will have less impact on mortality. 7) Women will experience more severe impacts on chronic illness mortality as a result of war.

Previous Work

Until fairly recently, there have been few studies that explore the indirect health consequences of war. The studies that do exist focus mainly on mental health issues such as posttraumatic stress disorder (Levy and Sidel 2009). There is a also body of research that looks at the impact of conflicts on infectious diseases (Bunton and Wills 2005b; Cliff and Noormahomed 1993b; Garfield 1985; Iacopino and Waldman 1999a; Murray et al. 2002). In this study, I am exploring the effect that armed conflict has on cardiovascular disease mortality. Indirect health consequences of war such as these have not been researched in great detail although they play a significant role in mortality across the globe. As Murray et al. (2002) stated, war-related injury and deaths are a large contributor to disease on a global scale. They explain that because information systems are broken down during conflict, it is difficult to understand the magnitude of death and disability. Levy and Sidel (2009) find that armed conflict creates both direct and indirect health problems for military personnel as well as civilians. They note that most research has focused on short-term direct health effects of armed conflict. They add that the few studies that explore long-term effects focus mainly on issues of mental health such as posttraumatic stress disorder. Another limitation of the literature that I have encountered is that very few studies have conducted longitudinal, cross-national research. One exception is an article written by Li and Wen (2005), which explored the impact of armed conflict on adult mortality across countries and over time. They constructed age-sex-cause-specific death rates using national statistical registries and population counts obtained from the World Health Organization. Their final dataset included information from 84 countries spanning the years 1961 to 1998. The authors used several measures of

armed conflict to explore the effects of various types of conflict on adult mortality rates. They found that the effects of civil war were stronger than the effects of interstate armed conflict on mortality rates immediately following the conflict. Interestingly, the opposite was found for the lingering effects. As most would expect, they did find that the effects of severe conflict were much stronger than the effects of minor conflict. Their results demonstrated that males bear more of the immediate brunt following conflict, whereas females suffer increased mortality rates as a lingering effect of conflict. I owe much of my theoretical and methodological framework in this piece to the unique contributions put forth by Li and Wen (2005). Cause-specific mortality is not explored in their article, which is an aspect that this study seeks to address.

Another foundational piece within the literature is a study that explored the impacts of civil war on civilian populations (Ghobarah, Huth, and Russett 2003). This study also used World Health Organization data to explore death and disability among populations who had experienced internal armed conflict. The authors focus on the long-term impacts and examine a variety of different debilitating diseases and conditions that emerge as indirect consequences of civil armed conflict. In their conclusions, they make the comparison that suggests the amount of death and disability experienced in the year 1999, because of lingering effects of war, is equal to that experienced as a direct result of war during the years 1991-1997. While this study does provide important insight into the effects of civil wars, it does not examine the impact of interstate conflict or the varying levels of intensity associated with various types of conflict. In this study, I attempt to address those issues.

Theoretical Perspective

The general theoretical perspective of this study is that the stresses of armed conflict on civilian as well as military populations lead to a depleted state of well-being that results in an increase in diseases such as cardiovascular disease. Armed conflict also damages infrastructure and limits health care access and delivery. Rose and colleagues (1987) found an increase in ischemic heart disease mortality associated with combat veterans who experienced traumatic leg amputations. Falger et al. (1992) found that Dutch World War II veterans experienced higher rates of cardiovascular disease. The authors attribute this increased risk for cardiovascular disease to be associated with war experiences and also related to posttraumatic stress disorder. Kang, Bullman, and Taylor (2006) also found that World War II prisoners of war had higher rates of cardiovascular disease, which is related to posttraumatic stress disorder. Increased levels of stress are known to weaken the heart and increase the likelihood of cardiovascular ailments. In their 1998 study, Kubzanksy et al. conclude that chronic heart disease (CHD) may develop as a result of anxiety. They add that the risk for CHD may be increased by chronic anxiety for several reasons. These include risky health behaviors, increased hypertension, and an increased chance of triggering deadly coronary failures.

Military personnel are not the only people at risk for increased morbidity and mortality as a result of being exposed to armed conflict (Li and Wen 2005; Murray et al. 2002). Head and colleagues (2008) used birth weight data and late life hospital admissions for CVD to examine the effect of under-nutrition in infancy on later life CVD. The data measuring birth weight were timed to coincide with the German occupation of the Channel Islands during World War II. A control group of individuals

born at the same time and who had been evacuated or otherwise left the area were also used in the study. The authors found that the prevalence of CVD was correlated with exposure to the occupation. The lack of proper nutrition during the occupation was cited as a major factor. The impact of food deprivation during the occupation had a stronger impact on CVD prevalence among all age groups than undernourishment *in utero* before the war.

Being subjected to armed conflict can also increase the levels of risk behaviors engaged in by populations. People who are exposed to armed conflict may engage in risky behavior in order to cope with the stress experienced both during and after the conflict. In their 2007 study, Aida and colleagues found that in postwar Bosnia and Herzegovina, cardiovascular disease risk factors including smoking, obesity, and hypertension were disproportionately high among both men and women. The authors argue that this increased risk for cardiovascular disease comes as the result of the stresses of war. Wilkinson (2007) also finds that there are high rates of increased risk and unhealthy lifestyles causally associated with cardiovascular disease in Bosnia and Herzegovina.

An important limitation of the literature is that it is sparse and sporadic. As previously mentioned, there are few studies that explore the indirect health consequences of armed conflict. There are even fewer that focus on chronic or infectious diseases. Of the studies that do exist, I am aware only of Li and Wen's (2005) work that has a time-series and cross-national design allowing for broad applicability and generalizability. This is a key factor as to why studies such as this one provide an important contribution to the literature and field in general.

Conflict type can play an important role in the health outcomes experienced by populations. It is logical that as the severity of the conflict increases, the mortality and adverse health consequences related to the conflict also increase. The length of time that populations are exposed to armed conflict will likely also play an important role in the severity of both direct and indirect health consequences. Internal conflict, or civil war, can be especially devastating on populations. Because most if not all of the fighting occurs within a given territory, the local populations bear much of the brunt of the conflict. Ghobarah, Huth, and Russett (2003) find that civil wars produce devastating effects on civilian populations because of exposure to conditions that increase exposure to disease, injury, and death.

In this study, I not only compare and contrast the differences between women and men, but also pay particular attention to the severity of the war effects on both sexes individually and comparatively. Sibai, Fletcher, and Armenian (2001) discovered that women experienced higher rates of cardiovascular disease mortality after a 16-year civil war in Lebanon. They found that exposure to war-time trauma occurring to the women's families or to themselves created a significantly greater risk of cardiovascular disease mortality compared to men. Men experienced greater heart disease mortality rates when they experienced property loss and work-related difficulties. All people who were displaced during wartime experienced greater risk for cardiovascular disease mortality. Jansen (2006) adds that gender inequality experienced by women is magnified by armed conflict. The author states that women suffer disproportionately in terms of human rights, access to resources, and personal safety. Men tend to experience higher rates of mortality during conflict. Battle-related deaths are typically higher for males than

females. It stands to reason that women experience higher rates of long-term negative effects because they live long enough to experience them. Many of the men who potentially could have died from cardiovascular disease indirectly related to previous conflict later in life are likely to have died before the disease was able to cause death.

Data

I have compiled a dataset from a variety of sources including the World Health Organization Mortality Database and Population Database, Uppsala Conflict Data Program at the Department of Peace and Conflict Research, Center for the Study of Civil War at the International Peace Research Institute in Oslo, Armed Conflict Database, Ghobarah, Huth, and Russet (2003) Inequality Data, Deininger & Squire Income and Inequality Data, Polity IV Database, World Bank World Development Indicators, and Organization for Economic Cooperation and Development. These data are linked by a country identifier.

The working sample consists of data from 134 countries over a 40-year period from 1960 to 2000. Country names are presented in the Appendix. Multivariate regression analyses with fixed and random effects models are used. The dependent variables are mortality rates log transformed to correct for the skewness of the distribution. Key independent variables – measures of conflict - are lagged one year to prevent reverse causality. Using lagged independent variables is helpful for reducing reverse causation given the possibility that conflicts may emerge due to high mortality rates of the adult population, which may result in desperate situations (Li and Wen 2005). I use STATA version 13 64-bit to create the dataset and run regression models.

Dependent Variable

The dependent variable is the cause-specific crude mortality rate stratified by sex for the population. To create this variable, data from the World Health Organization (WHO) Mortality Database (World Health Organization 2008) were used. This database contains a compilation of death counts specified by sex, cause of death, and age. It also contains population counts specified by sex and age. These counts are obtained from national statistic registries of 134 countries spanning the years 1950 to 2001. Mortality rates are calculated using the WHO death and population counts. The rates measure total deaths per 1,000 in each specified category.

Independent Variables

Several measures of armed conflict are used to test the hypotheses. The Armed Conflict Database (Gleditsch et al. 2002) provides several measures of armed conflict ranging from minor to severe, internal and external, as well as variations on some categories. Each conflict variable is measured in dummy form where 1 = yes and 2 = no as well as continuous form measuring the percentage of time that a country has experienced the given type of conflict. Reverse causality is a concern that is alleviated by lagging each of the conflict variables by a year. The concern is that if a country experiences high mortality rates among working age populations, this may result in desperate situations from which conflict emerges. Lagging the key independent variables by a year will prevent reverse causality and is a commonly used approach in time-series cross-national designs (Li and Wen 2005). I will now describe each of the conflict variables. Conflict Dummy is a dichotomous variable expressing whether or not there

has been armed conflict involvement in the given country. Conflict History measures the percentage of time since 1946 that a country has been involved in an armed conflict.

The Interstate Dummy variable expresses whether or not there has been armed conflict between two or more states. Interstate History measures the percentage of time since 1946 that a country has been involved in an armed conflict with at least one other state. The Intrastate Dummy variable expresses whether or not armed conflict has occurred between the government of the state and one or more internal opposition groups with or without intervention from other states. Intrastate History measures the percentage of time since 1946 that a country has been involved in an armed conflict occurring between the government of the state and one or more internal opposition groups with or without intervention from other states. The Minor Conflict Dummy expresses whether or not a country has been involved in a minor conflict defined as resulting in between 25 and 999 battle-related deaths per year. Minor Conflict History measures the percentage of time since 1946 that a country has been involved in minor conflict defined as causing between 25 and 999 battle-related deaths per year.

Control Variables

A number of control variables are included in the analysis to account for demographics, political structures, development characteristics, time, location, infrastructure, and other measures of conflict and health outcomes at the country level. In Western societies, democracy is considered to be a superior political system as it theoretically emphasizes and aims to protect human rights. In contrast, countries that are more democratic can experience greater income equality and per capita income growth

(Przeworski et al. 2000). As the level of democracy increases, a nation's level of prosperity and well-being tends to increase as well. Countries that are more democratic, as opposed to autocratic, tend to experience greater equality and access to resources (Przeworski et al. 2000; Reuveny and Li 2003). Although there is debate in the literature, there is some evidence that if there is more equality with regard to access to resources, the population may experience better health (Wilkinson 1996). Therefore, it is expected that the level of democracy will decrease the negative health effects experienced as a result of war. To measure the level of democracy, I use the Polity IV database (Marshall and Jaggers, 2007). This data project has created an empirical measurement of democracy on a continuous scale ranging from 0 to 10. Autocracy is similarly measured in the opposite direction from 0 to negative 10. Democracy is measured by a continuous variable ranging from –10 to 10. A score of -10 represents complete autocracy. A score of 10 represents a country that is strongly democratic.

Medical infrastructure is represented by three variables. The first is the number of hospital beds available per 1,000 persons. The idea is that as the availability of medical care increases, mortality will decrease. The second is per capita health expenditure. This variable provides a measure of the amount of money spent on health expenditures per capita. The amount is converted to the current U.S. dollar equivalent. The third measure of medical infrastructure is number of physicians in a particular country. As a country's medical infrastructure grows, there will be more doctors present in the system. Chronic illnesses such as cardiovascular disease are often affected greatly by preventative care. If there are not doctors available in a country, it will be unlikely that its citizens will be able to access preventative care and therefore, the likelihood of deleterious health outcomes

increases.

Time can also play an important role in the advancement of medical technologies. I use the year variable to control for the possibility that over time, mortality rates have decreased overall. Because medical advancement continues to grow at an exponential rate, the year that a country experiences an armed conflict may have an influence on the intensity of mortality that is experienced. I have data from 134 countries that span half a decade from 1950 to 2001.

GDP standardized to current U.S. Dollar is used to control for economic development. Using GDP per capita is normative in cross-national research, but proved to be less effective at demonstrating statistically significant relationships in my models. This is something that should be explored in more detail in future research. A number of studies have demonstrated links between economic development and downturns to health outcomes including cardiovascular disease (see Brenner 1973; Brenner and Mooney 1983). This variable is created using data from the World Bank World Development Indicators (2002). On the following page is a conceptual theoretical map (Figure 1) to help visually express the relationship between variables.

Results

Analytical results are presented in Tables 1, 2, 3, and 4. Table 1 shows the results of the random effects regression models of armed conflicts on mortality for females whose cause of death was cardiovascular disease. Table 2 displays the results for the fixed effect models on female cardiovascular disease mortality rates. Tables 3 and 4 display the results for the random and then fixed effects models on male

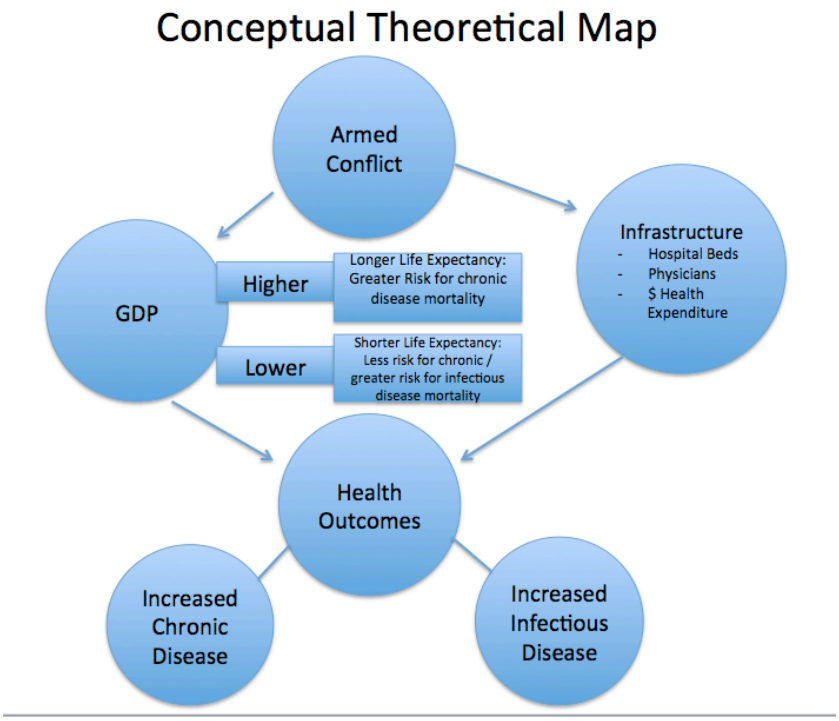

Figure 1 - This theoretical map visually represents the relationship between variables included in the analysis. If armed conflict is present, infrastructure can be damaged and economies can be disrupted, which in turn can result in negative health outcomes including increased chronic and infectious disease.

cardiovascular disease mortality rates, respectively. Each table displays conflict variables and all of the control variables. The tables include the following models: Model 1 displays the aggregate effect of all conflict types. Model 2 displays the lingering effects. Model 3 focuses on the immediate effects of interstate conflicts while Model 4 displays the lingering effects. Model 5 focuses on the immediate effects of intrastate conflicts and Model 6 displays the lingering effects. Model 7 displays the immediate effects of minor conflicts and Model 8 displays the lingering effects.

In discussing the results, I will focus on the random effects models (Tables 1 and 3). The reason for this is that there is greater variation between countries, rather than

Table 1 Effects of Armed Conflict on Female Cardiovascular Disease Mortality, 1960-2000 Random Effect Models

	1.1 *aggregate conflict*	1.2 *aggregate history*	1.3 *conflict type*	1.4 *conflict history*	1.5 *conflict type*	1.6 *conflict history*	1.7 *conflict type*	1.8 *conflict history*
Conflict dummy (t-1)	10.599**							
Conflict history (t-1)		0.111						
Interstate dummy (t-1)			4.406					
Interstate history (t-1)				4.648***				
Intrastate dummy (t-1)					4.406			
Intrastate history (t-1)						-0.117		
Minor conflict dummy (t-1)							16.517***	
Minor conflict history (t-1)								-0.062
Control Variables								
Number of Hospital Beds	-0.794	-0.939	-0.708	-0.745	-0.708	-0.515	-0.603	-0.696
Number of Physicians	-6.292	-5.860	-6.11	-5.862	-6.113	-4.443	-7.588	-4.651
Health Expenditure P/C	-0.016**	-0.015*	-0.015*	-0.012	-0.015*	-0.014*	-0.016**	-0.014*
GDP (Intnl. Dollar)	4.776	4.806	3.335	4.478	3.335	-7.133	6.017	-5.511
Democracy	-1.735	-1.514	-1.590	-1.624	-1.590	-1.593	-1.375	-1.453
Year	0.233	-0.138	0.079	0.244	0.079	0.209	0.062	0.102
Constant	-432.879	304.245	-91.744	-474.599	-91.744	-131.710	-122.719	41.624
R2	0.022	0.024	0.132	0.009	0.013	0.003	0.027	0.001
N	295	295	295	295	295	295	295	295

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 2 Effects of Armed Conflict on Female Cardiovascular Disease Mortality, 1960-2000 Fixed Effect Models

	2.1 *aggregate conflict*	2.2 *aggregate history*	2.3 *conflict type*	2.4 *conflict history*	2.5 *conflict type*	2.6 *conflict history*	2.7 *conflict type*	2.8 *conflict history*
Conflict dummy (t-1)	10.317**							
Conflict history (t-1)		0.028						
Interstate dummy (t-1)			4.130					
Interstate history (t-1)				4.977***				
Intrastate dummy (t-1)					25.140***			
Intrastate history (t-1)						-0.017		
Minor conflict dummy (t-1)							16.001***	
Minor conflict history (t-1)								-0.062
Control Variables								
Number of Hospital Beds	-0.711	-0.739	-0.626	-0.690	-0.781	-0.674	-0.529	-0.696
Number of Physicians	-5.313	-4.773	-5.082	-5.160	-9.170	-4.693	-6.600	-4.652
Health Expenditure P/C	-0.014*	-0.014*	-0.014*	0.010	-0.017**	-0.014*	-0.015*	-0.014*
GDP (Intnl. Dollar)	-2.477	-4.280	-4.206	-1.432	4.283	-5.414	-1.090	-5.511
Democracy	-1.602	-1.422	-1.454	-1.500	-1.458	-1.448	-1.253	-1.453
Year	0.344	0.056	0.195	0.351	0.359	0.105	0.173	-.102
Constant	-515.900	102.015	-177.579	-592.941	-706.895	33.169	-209.751	41.624
R2	0.0003	0.0003	0.0004	0.0034	0.0200	0.0013	0.0012	0.0013
N	295	295	295	295	295	295	295	295

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 3 Effects of Armed Conflict on Male Cardiovascular Disease Mortality, 1960-2000 Random Effect Models

	3.1 *aggregate conflict*	3.2 *aggregate history*	3.3 *conflict type*	3.4 *conflict history*	3.5 *conflict type*	3.6 *conflict history*	3.7 *conflict type*	3.8 *conflict history*
Conflict dummy (t-1)	23.914***							
Conflict history (t-1)		-0.012						
Interstate dummy (t-1)			6.616					
Interstate history (t-1)				2.635				
Intrastate dummy (t-1)					30.750***			
Intrastate history (t-1)						-0.002		
Minor conflict dummy (t-1)							1.451	
Minor conflict history (t-1)								-0.011
Control Variables								
Number of Hospital Beds	-1.587	-1.565	-1.467	-1.534	-1.635	-1.578	-1.565	-1.583
Number of Physicians	-16.202	-15.085	-15.656	-14.996	-20.180*	-15.092	-15.262	-15.110
Health Expenditure P/C	-0.015	-0.014	-0.014	-0.012	-0.017	-0.014	-0.014	-0.014
GDP (Intnl. Dollar)	-21.799	-27.252	-25.840	-26.632	-19.232	-27.086	-26.835	-26.930
Democracy	3.601*	4.108*	4.079*	4.108*	4.353*	4.112*	4.151*	4.108*
Year	2.117	1.529	1.702	1.712	1.960	1.522	1.534	1.520
Constant	-3516.761	-2213.488	-2593.648	-2608.724	-3262.965	-2204.100	-2233.872	-2202.507
R2	0.0263	0.0339	0.0337	0.0308	0.0174	0.0338	0.0335	0.0336
N	299	299	299	299	299	299	299	299

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4 Effects of Armed Conflict on Male Cardiovascular Disease Mortality, 1960-2000 Fixed Effect Models

	4.1 *aggregate conflict*	4.2 *aggregate history*	4.3 *conflict type*	4.4 *conflict history*	4.5 *conflict type*	4.6 *conflict history*	4.7 *conflict type*	4.8 *conflict history*
Conflict dummy (t-1)	22.754**							
Conflict history (t-1)		-0.317						
Interstate dummy (t-1)			5.548					
Interstate history (t-1)				2.792				
Intrastate dummy (t-1)					28.650***			
Intrastate history (t-1)						-0.265		
Minor conflict dummy (t-1)							0.168	
Minor conflict history (t-1)								-0.186
Control Variables								
Number of Hospital Beds	-1.305	-0.836	-1.186	-1.277	-1.385	-0.870	-1.285	-1.272
Number of Physicians	-12.706	-11.025	-11.933	-11.692	-16.580	-10.823	-11.491	-11.223
Health Expenditure P/C	-0.011	-0.009	-0.009	-0.077	-0.012	-0.009	-0.009	-0.009
GDP (Intnl. Dollar)	-46.295**	-59.957**	-52.160**	-51.376**	-43.991**	-61.158**	-53.063**	-54.931**
Democracy	3.993*	4.331*	4.477*	4.507*	4.704**	4.269*	4.509*	4.444*
Year	2.496	2.230	2.103	2.115	2.322	2.316	1.951	2.011
Constant	-3691.387	-2836.988	-2781.166	-2845.315	-3412.729	-2977.334	-2454.743	-2526.656
R2	0.0387	0.0426	0.0422	0.0462	0.0343	0.0431	0.0419	0.0416
N	299	299	299	299	299	299	299	299

* significant at 10%; ** significant at 5%; *** significant at 1%

within countries over time.[1] Because I am focusing on changes in mortality as a result of unique experiences (armed conflict) in different countries, random effects models are more substantively justified than fixed effect. Hausman tests demonstrated that there is not a statistically significant difference between the fixed and random effects models, and therefore, a decision to focus on the random effects models is justified. I have included the fixed effect models as a reference as well.[2]

I first describe the effect of each type of conflict associated with each sex followed by the effects of the control variables. I start with the first model and proceed through to the eighth model. I begin now with the effects of each type of conflict and the effects that they have on cardiovascular disease mortality. In Model 1 of Table I, I find statistically significant results demonstrating that if a country has experienced conflict, there is on average a 10.599 unit increase in cardiovascular disease mortality among females. When it comes to the independent variables, only health expenditures per capita produced statistically significant results. This negative result makes sense as an increase in resources to support the health infrastructure of a country is logically associated with better health outcomes, specifically, lower rates of cardiovascular disease mortality.

---

[1] *Baseline models were run using only CVD mortality rates and conflict measures. Each additional control variable was then added to each subsequent iteration of the analysis until the final models were developed.*

[2] *After running VIF for OLS models to explore multicollinearity, I found VIF measures ranging from 0.2 to 0.8. It is my understanding that a general consensus considers 0.6 to be too high. These results suggest that some of the variables in my model are fine, while others are borderline. This may or may not be problematic given that even extreme multicullinearity does not violate OLS assumptions. My results do not suggest "extreme multicollinearity." Also, one important impact of multicollinearity is increased standard errors. Given that my results are already weak (low or no statistical significance) it does not appear that the slightly borderline results are causing significant problems.*

Although not statistically significant, we see this same pattern represented by the hospital beds and physicians variables.

In the second model, the effect of armed conflict appears smaller and also not statistically significant. This is representative of broader patterns in the findings, which I believe reflect the difficulty to capture indirect health effects for a number of reasons that will be discussed in subsequent sections. One consideration may be that in severe armed conflict, mortality rates are increased to the point where those who may have later died of cardiovascular disease are eliminated before enough time passes for this effect to emerge.

The third model focuses on interstate armed conflict, or war fought between states. We see very similar results to that of model number 2. The results for interstate history, in model 4, are interesting in that they are highly statistically significant and demonstrate a measurable increase in cardiovascular disease mortality for females over time as a result of interstate armed conflict. It should be noted, however, that the R2 for all of the models is low. This confirms that determining the impact of various factors on indirect health outcomes is very difficult to do with broad comparative data. The sample size is also relatively small, due to the fact that data are very limited and the models constrain even further the number of cases available for comparison.

The most significant findings for female cardiovascular disease mortality is demonstrated by the model specifically examining minor armed conflict, or war resulting in at least 25 but not more than 1,000 battle related deaths. Perhaps the measurable effect of armed conflict increasing female cardiovascular disease mortality demonstrates the detrimental impact of war, without pushing the death toll high enough to eliminate future cause-specific mortality. In other words, it appears that even minor armed conflict creates

measurable increases in mortality without eliminating significant portions of the population.

When examining male cardiovascular disease mortality represented in Table 3, we see similar patterns. The effect of armed conflict on males is nearly double that experienced by females. However, minor conflict produces significantly smaller results that are not statistically significant for males. This supports the broader literature that suggests that females bear more of the long-term brunt of war than males. Consistent patterns are reflected throughout the findings, suggesting that increased medical infrastructure is associated with decreases in chronic disease mortality. These data, however, make it very difficult to draw such conclusions as it is known that more stable, economically developed nation-states tend to experience greater chronic disease mortality. This is due in part to the fact that less-developed nations suffer greater infectious disease occurrence and resulting mortality as a result of few resources. These factors include medical-technology infrastructure, sanitation, access to clean water and food, and so on.

Interestingly, the level of democracy appears to have a statistically significant impact on male but not female mortality. The coefficients are not very large in any of the models but the positive coefficicents for males are surprising. This may be due in part to a selection bias. I suspect that countries that are more democratic may have better information systems, which allow for better record keeping. In other words, more democratic countries may more accurately report armed conflict while nondemocratic nations may under-report it. Also, it is very rare for a democratic country to wage war against another democratic nation. This fact limits the inclusion of democratic nations in

the sample and could therefore produce weak results.

The per capita health expenditure had the anticipated effect of a negative relationship. However, it was only statistically significant for females. The coefficients were very small, which would once again support the idea that more developed nations may be able to better prevent chronic illness deaths, but at the same time experience higher rates of these diseases simply due to selection. People may not live long enough to die from cardiovascular disease in less developed nations.

In general, the results are consistent with the literature that concludes females experience more severe impacts as a results of armed conflict (Jansen 2006). In this case, the adult CVD mortality rate was increased more dramatically for females than for males as a result of war. It seems that conflict in general increases chronic illness mortality such as CVD. Of note is the idea that conflict history may exert a much stronger effect on mortality over time because chronic diseases often take years or decades to be manifest. There are studies that have found that the long-term consequences of armed conflict meet or exceed the negative health impacts directly caused by conflict (Ghobarah, Huth, and Russett 2003).

Limitations

There are several important limitations that should be mentioned regarding this study. First, the quality of available data is very questionable. Nations states such as Iraq and Afghanistan, both having experienced significant armed conflict over the past several decades, do not have any data available. However, of data currently available, those used in this analysis are the most reliable. Armed conflict disrupts every aspect of society and

it is likely that record keeping during these types of conflicts was severely disrupted. Also, severe conflict creates much higher mortality rates during and soon after the conflict ends. This means that a greater proportion of the population is eliminated before they have the chance to develop chronic ailments such as cardiovascular disease. Also, increased overall morbidity and mortality rates during times of severe conflict cause excessive burdens on hospitals and clinics. This may disrupt not only record keeping, but also the ability to treat chronic conditions. Doctors and medical personnel often flee areas of extreme conflict (Docquier, Lohest, and Marfouk 2007). The burden created by depleted resources, infrastructure, and personnel may reduce record keeping and treatment abilities. At the same time, mortality is greatly increased as a result of the direct health consequences of war. The bias caused by data quality is arguably a conservative one with the significance levels of hypothesis testing likely underestimated (Li and Wen 2005).

Also of note, data are only available from the post-World War II period up to but not including the current age of warfare, such as post-September 11, 2001. While this time frame does capture a great deal of armed conflict that has country data available, it would be interesting to explore historical as well as contemporary examples. I must also acknowledge the fact that while international standards have greatly improved as time goes on, record keeping and data coding may not be as consistent across countries and over time as we may like. This is not a major concern as the results still demonstrate the destructive impact that armed conflict has on human mortality. Armed conflict in the post-9/11 era has also shifted away from state-to-state violence. Armed militant groups such as Al-Qaeda, Al-Shabaab, and ISIS represent the most active global combatants.

They also operate independently of nation-state status recognized by the global community. There may well be state support for these groups, but a clear distinction moving away from countries going to war against other countries has been demonstrated as an emergent pattern. This increases the difficulty of capturing health effects, as it is often unclear who combatants are and specifically where they come from. Mass migrations, including the recent Syrian refugee crisis (the largest mass migration on record) further compound the difficulty in measuring these outcomes.

Given the fact that these data limitations exist and the results are still as strong as they are speaks to the confidence that can be realized in concluding that armed conflict has deteriorating effects on chronic disease mortality and health in general. Perhaps if more countries were better able to diagnose and record cause-specific mortality, we would find that the impact of armed conflict on mortality would increase dramatically.

Conclusion

Violent conflict can quickly lead to a dismantled infrastructure, depleted health care system, damaged economy, and an overall destruction of society. All of these societal components contribute directly or indirectly to the health of populations. When any of these components are disrupted, depleted states of well-being are inevitable. The societal disruption created by armed conflict often reaches levels of intensity that result in severe consequences such as increased morbidity and mortality. During times of conflict, it becomes more difficult to keep records and to accurately account for death and disease. Data that do exist are not likely to capture the full extent of what happens during devastating events. It is also difficult to parse out the exact causes of particular health

outcomes occurring years down the road.

War directly effects population health by increasing death and injury. Bullets and bombs kill and maim people. War indirectly effects population health in a number of ways. Supply chains can become limited or completely cut off. When patients are unable to receive medicine and necessary treatment supplies, the risk of mortality increases. If food and clean water are limited or unavailable, health risks become increasingly dangerous. Hospitals may become damaged or inaccessible. If this is the case, individuals are not able to seek treatment and even minor ailments can become serious problems. Doctors and medical personnel often have access to resources that allow them to flee areas of conflict, leaving a void of necessary medical care. Damaged infrastructure can result in outbreaks of deadly diseases. For example, bombs can damage pumps and piping that move water and waste. If sewage and water treatment facilities are damaged, infectious disease can spread quickly. Increased levels of overall stress among populations can decrease levels of well-being and increase things such as cardiovascular disease. All of these depleted states of societal well-being can result in both short- and long-term devastation to the health of populations affected by war.

Until fairly recently, there have been few studies that explore the indirect health effects of war. The studies that do exist focus mainly on mental health issues such as posttraumatic stress disorder (Carlton-Ford, Ender, and Tabatabai 2008; Levy and Sidel 2009). There is also a growing body of research that looks at the effects of conflicts on infectious diseases (Bunton and Wills 2005a; Cliff and Noormahomed 1993a; Garfield et al. 1989; Iacopino and Waldman 1999b; Murray et al. 2002; Smallman-Raynor and Cliff 2000). The indirect health consequences of war have not been researched in great detail

despite the fact that they play a significant role in morbidity and mortality across the globe. Levy and Sidel (2009) find that armed conflict creates both direct and indirect health problems for military personnel as well as civilians. Murray et al. (2002) conclude that war-related injury and deaths are a large contributor to disease on a global scale. They note that it is difficult to understand the magnitude of death and disability during conflict because information systems are broken down.

There are also a limited number of studies that have examined the effects of war on specific portions of the population such as children. Children tend to suffer disproportionately as a result of armed conflict. Carlton-Ford (2004) found that child mortality rates in Iraq more than doubled during the 1991 Gulf War (2004). Children under the age of five experience higher rates of mortality as a result of war than most other age groups. According to Carlton-Ford, limited access to food supplies as a result of war can increase child malnutrition rates by about 25 percent. This can have devastating effects on the health and well-being of civilian populations. With the technological advancement of weaponry since World War II, civilian wartime casualties have increased from 10 to 90 percent (Levy and Sidel 2000).

Other research has focused on specific types of conflicts such as a study that explored the impacts of civil war on civilian populations (Ghobarah, Huth, and Russett 2003). This study also used World Health Organization data to explore death and disability among populations who had experienced internal armed conflict. The authors focus on the long-term effects and examine a variety of different debilitating diseases and conditions that emerge as indirect consequences of civil armed conflict. In their conclusions, they make the comparison that suggests that the amount of death and

disability experienced in the year 1999, because of lingering effects of war, is equal to that experienced as a direct result of war during the years 1991-97. While this study does provide important insight into the effects of civil wars, it does not examine the impact of interstate conflict or the varying levels of intensity associated with various types of conflict. The current war in Iraq has displayed characteristics of both civil and interstate armed conflict. It will be important to examine the long-term effects of the conflict on mortality and morbidity after years have passed and data become available.

There has been very little research done that explores the indirect effects that war has on rates of chronic diseases. It is difficult to measure and study these outcomes due to the nature of war. This study examines the effects of war on population health by measuring changes in cardiovascular disease mortality among 134 countries across a span of 40 years. I found that all types of armed conflict have negative health impacts on populations. Four different types of armed conflict examined in this paper include interstate, intrastate, minor, and severe. The adult cardiovascular disease mortality rate is increased by each type of conflict for males and females. The mortality rate increases as the amount of time each of the types of conflicts is experienced increases. It is logical that the time a population is involved with conflict is positively correlated with the amount of total devastation experienced. As devastation increases, the health and well-being of the population decreases. Therefore, as the duration of conflict increases, so too do the negative health effects. Intrastate conflict, or civil war, increases adult mortality at a much greater rate than interstate conflict. It makes sense that when all of the violence is experienced within a single country rather than spread across different geographical areas, there is greater devastation to population health. All groups involved in the

conflict are members of the same unit of analysis: country.

An interesting finding of this study is that within these contexts, minor conflict appears to produce greater mortality than that of severe conflict. This is likely due in large part to the fact that I am accounting for cardiovascular disease mortality, which only becomes apparent after time. Severe armed conflict will immediately eliminate much of the population who would later be prone to cardiovascular disease.

Females bear more of the brunt than males. Males experience greater morbidity and mortality during conflict, which in turn creates an excess burden on females who are left to care for themselves in addition to children and households. When a significant portion of the males in a population are eliminated, it also places an additional burden on females as they are left with a disproportionate economic, political, and social responsibility. Increased stress levels and less support may be indicative of increased rates of cardiovascular disease.

Armed conflict has been a part of human history for as long as we have records. It is more likely than not that this will continue to be the case for as long as inequality exists in the world. While it is unreasonable to say that we should end armed conflict all together, it is worth exploring ways in which we can prevent and minimize the impact once conflict arises. There are many indirect health consequences that emerge as a result of extreme violence. I have only looked at one small aspect of these consequences in this paper. Further research is needed in order to better understand each of the mechanisms that were discussed but not specifically measured or tested in this paper. Further research should also investigate the effects of various other chronic as well as infectious diseases. Murray et al. explain, “Improved collaboration between political scientists and experts in

public health would benefit measurement, prediction, and prevention of conflict related death" (2002: 346). Further research should explore specific ways in which armed conflict impacts chronic disease. If we are able to better understand the mechanisms such as depleted resources and damaged infrastructure that cause increases in mortality, many lives could be improved and saved. Policy makers and leaders who make the critical decisions of when to engage in armed conflict need to be as informed and educated as possible regarding the potential outcomes and human costs of war.

CHAPTER III

INFECTIOUS DISEASE AND WAR:

CHOLERA IN IRAQ

Introduction

The effects of extreme violence such as the recent U.S.-led war in Iraq can be very far-reaching, often having severe indirect consequences. We typically think of the direct health consequences of war such as soldier and civilian casualties caused by bullets and bombs. There are, however, numerous indirect health consequences that devastate populations (Ghobarah, Huth, and Russett 2003; Murray, King, Lopez, Tomijima, and Krug 2002). Because many of these indirect effects only become evident over time, policy makers and those who have the most control over initiating violence often do not take these factors into consideration. As armed conflict continues to affect populations around the globe, it is extremely important to explore the real human cost of war.

Armed conflict disrupts all aspects of civil life. Agriculture, trade, and production may all be interrupted. War can have devastating effects on economies if the means of production are limited or eliminated and consumers are killed or displaced. Governments can be overthrown or destabilized. If they do remain intact and functional, war often draws resources away from public services such as food security, water treatment and distribution, sewage management, and the production of electricity. The displacement of

large proportions of communities as well as the loss of public servants also regularly occurs during violent conflict. War also exacerbates civil divisions, creating internal conflicts. All of these factors contribute to adverse health consequences.

In this chapter, I analyze how the Iraq War, which started in 2003, contributed to a cholera outbreak (an indirect health effect of war), given an array of structural disruptions. U.S. combat missions were declared ended in December 2011. However, U.S. troops remain in Iraq and continue to engage in support and training exercises as of the writing of this dissertation. The World Health Organization (WHO) (2003) reported a cholera outbreak shortly after the U.S.-led invasion of Iraq. The destruction of physical infrastructure, depletion of public health care systems, and limited access to medical supplies and clean water are said to account for the severity and duration of the outbreak (World Health Organization 2007). When any of these important societal elements are disrupted, the negative impact can be far reaching. One specific example is that with the absence of basic medical care, common ailments and illnesses that are easily treatable and not typically life-threatening have the potential to become overwhelming epidemics.

In what follows, I discuss research examining the relationship between war and indirect health effects. Then I briefly present the immediate historical context and data related to the cholera outbreak in Iraq. Following this, I analyze the structural, social conditions associated with armed conflict that contributed to the cholera outbreak. Based on this assessment, I consider what could have been done to address this adverse health situation.

War and Indirect Health Effects

Until fairly recently, few studies have explored the indirect health effects of war. Studies that do exist pay particular attention to psychological well-being (Carlton-Ford, Ender, and Tabatabai 2008). Posttraumatic stress disorder (PSTD), in particular, has been given careful consideration in many studies (Basogla, Livanou, Crnobaric, Franciskovic, Sujic, Duric, and Vranesic 2005; Falger, Op den Velde, Hovens, Schouten, De Groen, and Van Duijn 1992; Levy and Sidel 2009; Murthy and Lakshminarayana 2006). The literature is fairly consistent in showing a constant increase of psychological disorders such as PTSD as the result of exposure to armed conflict for militants as well as civilians.

A growing body of research considers the effects of conflicts on infectious diseases. Bunton and Wills (2005) determined that increased rates of sexually transmitted diseases (STDs), such as AIDS, often accompany war. STDs are especially prevalent when rape is used as a weapon against populations. History provides many examples of warfare in which armies use sexual assault as a weapon to demoralize, destabilize, and humiliate their enemy (Ashford and Huet-Vaughn 2000).

In the early twentieth century, Prinzing (1916) published a book that examined the influence of disease on war efforts. He detailed how throughout the seventeenth, eighteenth, nineteenth, and early twentieth centuries, diseases decimated entire armies, laid waste to significant proportions of civilian populations, and destroyed economies in direct relation to armed conflict. In the midst of a world war, scholars insisted upon the need to understand disease within the context of armed conflict. Hill (1942) explained that during World War I and World War II, diseases such as malaria killed more soldiers than bullets or bombs did in many conflict zones. The fact that diseases kill more people

in war than combat is a reoccurring theme in the medical literature. Smallman-Raynor and Cliff (2000) conclude that disease epidemics, which devastate military and civilian populations, are responsible for the most serious human costs of war. Infectious diseases such as measles, malaria, dengue fever, and leishmaniasis reached epidemic levels as a result of war in Nicaragua during the 1980s (Garfield, Frieden, and Vermund 1987).

Other research examines the importance of health care workers and information systems related to disease during times of war (Iacopino and Waldman 1999; Murray, King, Lopez, Tomijima, and Krug 2002). For example, armed conflict often undermines information systems, which disrupts the transmission of information, the coordination of needed supplies, and record keeping. As a result, it is safe to assume that estimated rates of disease infection related to conflict are often very conservative.

Other scholars have investigated how specific methods of warfare influence the health of civilians. The destruction of crops and food sources has been a common practice in war throughout the ages (Westing 1981). When access to food is limited, opposing forces gain advantages over weakened populations who are more susceptible to malnutrition and disease. The most vulnerable and defenseless segments of the population typically suffer the most. One specific example is the suffering experienced by children in Mozambique during the 1980s. Nearly half a million excess deaths among children were estimated as a result of war from 1981 to 1988 (Cliff and Noormahomed 1993). Of those children who were not killed, several hundred thousand were orphaned or separated from their families.

Within the social sciences, the structural determinations of the indirect health consequences of war have not been extensively researched despite the fact that they play

a significant role in morbidity and mortality across the globe. Levy and Sidel (2009) find that armed conflict creates both direct and indirect health problems for military personnel as well as civilians. Murray, King, Lopez, Tomijima, and Krug (2002) conclude that war-related injury and deaths are a large contributor to disease on a global scale.

Li and Wen (2005) conducted an empirical investigation to uncover how various types of armed conflict influence adult mortality across countries and over time. They found that the effects of civil war were stronger than the effects of interstate armed conflict on mortality rates immediately following the conflict. Interestingly, the opposite was found for the long-term effects of war. As most would expect, they did find that the effects of severe conflict were much stronger than the effects of minor conflict.

It has also been determined that there are distinct patterns regarding who within a population experiences the specific effects of war. Children tend to suffer disproportionately as a result of armed conflict. Carlton-Ford (2004) found that child mortality rates more than doubled in Iraq during the 1991 Gulf War and that rates of diarrhea doubled after the start of the 2003 war. As a result of war, children under the age of five experience higher rates of mortality than most other age groups. According to Carlton-Ford (2005), limited access to food supplies as a result of war can increase child malnutrition rates by about 25 percent. This condition has devastating effects on the health and well-being of populations. Subordinate groups in society often experience exacerbated negative impacts as well. For example, Jansen (2006) found that women suffer disproportionately greater loss as compared to their male counterparts as a result of armed conflict.

The impact of civil war on the health of civilian populations has also been

studied. Using WHO data, Ghobarah, Huth, and Russet (2003) investigate the long-term effects civil war and examine a variety of different debilitating diseases and conditions that emerge as indirect consequences of this type of conflict. They suggest that the amount of death and disability experienced in the year 1999, because of lingering effects of war, is equal to that experienced as a direct result of war during the years 1991-97. In other words, one year of indirect health effects is equal to that of seven years of direct effects. While this study does provide important insight into the effects of civil wars, it does not examine the impact of interstate conflict or the varying levels of intensity associated with various types of conflict.

It is clear that war has serious health effects on civil populations. Armed conflict contributes to the disruption of economic, political, and social institutions. It often undermines the foundations that support civil society, creating conditions that foster the outbreak of disease and increase morbidity. The current war in Iraq has displayed characteristics of both civil and interstate armed conflict. Here I contribute to needed sociological analysis of how war influences the health of civilians. Specifically, I examine how the structural changes associated with armed conflict in Iraq have contributed to the cholera outbreak, which has caused an increase in mortality, especially among children.

Cholera

Cholera is an acute, diarrheal disease that infects the intestine. The bacteria is spread by fecal contamination of food and/or drinking water. Symptoms range from very mild to severe and include vomiting, leg cramps, and diarrhea. Children as well as adults

are susceptible to the disease. Only about one in twenty cases of infection are considered to be severe. Typically, cholera is easily treatable if lost fluids and salts are replaced. If severe cases are left untreated, death by severe dehydration and kidney failure can occur within hours. The incubation period is very short – two hours to five days. This short incubation period can increase the chance of widespread infection. Nearly three out of four individuals infected with cholera do not notice any symptoms (World Health Organization 2008). An individual can carry the bacteria for one to two weeks and can therefore unknowingly contribute to the infection of others. Cholera is more dangerous than other diarrheal diseases in that it can kill a healthy adult in a matter of hours. Populations affected by war are often at greater risk of experiencing severe effects. Internally displaced persons, refugees, and many individuals affected by war often experience deteriorated states of well-being and can therefore fall victim more easily to the effects of cholera. Persons who are malnourished or have a weakened immune system are especially vulnerable and can suffer severe consequences shortly after contact with the bacteria.

During times of armed conflict, infectious diseases can spread quickly as populations are unable to seek or obtain treatment, medical systems are limited or non-existent, food and water supplies become contaminated, and populations can be confined to unhealthy living situations such as those often experienced in refugee camps. For example, when armed conflict broke out in Iraq, many individuals sought asylum in neighboring urban areas or had no choice but to find sanctuary in refugee camps. Both scenarios create a situation in which sanitation is difficult, supplies are limited, and infectious diseases can spread quickly throughout the dense population.

In 2003, WHO (2003) began reporting fears that the volatile security situation in the Iraqi conflict zones was creating a situation in which a cholera epidemic, an unusually high rate of disease infection, could become a dangerous reality. WHO cited the lack of access to safe drinking water combined with security problems to be the cause of major concern. They also indicated that diarrheal diseases were one of the top three killers of Iraqi children. While the first signs of the outbreak were detected in 2003, the outbreak became widespread by mid-August 2007. By October 2007, half of the Iraqi provinces had been affected by the outbreak (World Health Organization 2007). WHO estimated that more than 30,000 individuals had become stricken with acute watery diarrhea. At the time, more than 3,000 of those infected were confirmed cholera cases. The disease was expected to spread as the rate of infection climbed. Sociological analysis helps illuminate how armed conflict leads to social disruptions and structural changes that contribute to long-term, indirect health effects. In other words, part of the legacy of war involves the outbreak of disease and an increase in morbidity. In what follows, I will provide an analysis of how the armed conflict contributed to the destruction of physical infrastructure and the depletion of public health infrastructure, which helped sustain the cholera outbreak.

Destruction of Physical Infrastructure

The destruction of physical infrastructure due to armed conflict undermines the ability of a nation to take care of its population and creates an unhealthy environment. In the case of Iraq, the physical infrastructure has been damaged due to internal and external conflicts, deepening the structural conditions influencing the cholera outbreak. Here I

will consider distinct aspects of the armed conflict that have caused severe damage to the infrastructure exacerbating the cholera.

Municipal water supplies were severely damaged in Basrah during armed conflict (Valenciano et al. 2003). Approximately, 50 percent of the area's water treatment plants and the raw water pumping stations were damaged. Bombs and mortars severely disabled and completely dismantled pumps, storage tanks, piping, and electrical components involved in the processing and distribution of water. Electricity disruptions and shortages had devastating effects on water treatment and distribution facilities. When pumps fail, water cannot be treated and is not effectively distributed. The damage in Basrah during the war created a situation where clean water was no longer making it to destinations throughout the area. This led to individuals breaking into existing pipelines in order to obtain water, thereby further deteriorating the system. Treatment and pumping stations were also looted, leaving the water and sewage infrastructure severely damaged. There were also reports of sewage systems clogging and backing up. Trash was not collected causing drains to become blocked. Pumping stations were not working properly and shortages of electricity disrupted the pressure in the pumping system, which caused backflows and further contamination. The Basrah municipal sewage system backed up and flowed into the city. In this perfect breeding ground for cholera, it is no wonder that rates of infection increased. From May 17 to June 18, 2003, there were nearly 3,000 confirmed diarrhea consultations in the Basrah governorate. It is worth noting that these numbers are likely a very conservative representation of the total rates of infection as many cases go undetected or undocumented during normal conditions. During wartime, rates of infection are often greatly under-reported.

In 2008, the Iraqi Health Minister, Salih al-Hasnawi, stated that Iraq had experienced degraded water-treatment facilities as a result of years of war (Al Jazeera 2008). The depletion of infrastructure forced many Iraqis to go without clean water. The conditions within Iraq drastically deteriorated since the onset of the war. For example, Hacaoglu (2008) describes how Iraqi cities and rivers are rife with pollution. Buildings are crumbling and pose safety concerns. These conditions started to degrade due to 1991 Gulf War and the ten-plus years of sanctions that followed. The war starting in 2003 has only expanded and deepened the degradation. For example, water and sewage systems were further dismantled and destroyed after the 2003 invasion. There are a variety of additional factors that account for the dysfunctional state of the Iraqi utility infrastructure that are related to the armed conflict. These include lootings, sabotage, inconsistent delivery of electricity that disrupts water treatment, disrupted manpower, and system failures. Each of these structural factors will be discussed in this section.

The war in Iraq has fostered internal conflicts that have also resulted in the destruction of the physical infrastructure, as part of the campaign to undermine the established power structure. The violence in Iraq quickly became partisan as a civil war erupted between competing Shia and Sunni ethnic groups. Attacks on infrastructure and public utilities in particular often aim to disrupt the U.S. efforts and increase instability in the region. Public reports explain that in 2005, a sewage treatment plant in southern Baghdad had been targeted by insurgents in order to undermine the efforts of coalition forces in Iraq (Hacaoglu 2008). Workers were also attacked and the plant manager was killed. Looters stole pipes, electrical equipment, and wiring, which severely disabled the facilities. The plant, which was now unable to operate, had been recently repaired by U.S.

forces. Hacaoglu (2008) explains that three years had passed since the dismantling of the plant, yet raw sewage continued to flow into the Tigris River. Physical infrastructure is a key component of success or failure for both insurgents and coalition forces in Iraq. There is a direct correlation between depleted infrastructure and insurgent support in Iraq (Chiarelli and Michaelis 2006). When basic services such as water, sewage, and trash removal are disrupted or nonexistent, insurgent recruitment and activities increase. As members of the community experience more difficult living conditions, they become more willing to engage in desperate activities, which may involve receiving payment for attacking or sabotaging coalition forces or participating in these activities to satisfy their own vengeance. Thus, depleted living conditions and violence feed on each other. Increased violence is also correlated with higher rates of disease infection. In contrast, when reconstructive forces are able to improve the quality of life by creating or repairing services, members of the community are less likely to engage in confrontational behavior and more likely to work towards stability in their neighborhood. What happens with this infrastructure greatly influences the presence and outbreak of cholera.

Armed conflict can also interfere with supply chains and prevent necessary aid from reaching populations. Kratovac (2007) reported that 100,000 tons of chlorine designated for water treatment in Iraq were stopped at the Jordanian border in September 2007. Security issues were said to be the cause of the delay. It was feared that insurgents would use the chemical in explosives as they had done in the past. Kratovac (2007) quotes the head of the provincial health department, Hom Suhail al-Khishali, as saying that the deteriorated security situation prevented medical personnel from reaching those affected by contaminated water. She also indicatesd that there were many cases of

cholera reported in provinces such as Diyala where there were high concentrations of fighting in 2007. In this case, the armed conflict limited access to necessary treatment chemicals needed to provide safe drinking water. To make matters worse, interstate rivalry complicates matters. For instance, Iran has been accused of bribing local Iraqi officials to purchase expired chlorine, which was used to treat Iraqi water. The expired chlorine was no longer effective, which resulted in water that was not properly purified. This caused an increase in the exposure to contaminated water, and therefore increased rates of cholera infection (Cockburn 2008).

Armed conflict increases the occurrence of desperate actions on the part of the public. Looters also contribute to the dismantling of necessary infrastructure. Building materials such as copper pipe and electrical wiring are sought out by those wishing to make a profit from the stolen goods. For example, the Red Cross had supplied water pipes to a Baghdad hospital in order to create access to clean water; however, looters stole the pipes, leaving the hospital unable to access the water that it needed (Dyer 2003).

A tactic that has proven successful for insurgents in Iraq is to disrupt services in order to gain political support from residents (Chiarelli and Michaelis 2006). If services are disrupted, insurgents can gain support by denouncing the ability of coalition forces to provide stability and progress. Furthermore, insurgents can then take credit for improvements that have been made, whether or not they are actually responsible, and sway support toward their cause. Coalition forces have countered this strategy by advertising reconstruction projects and employing citizens to help complete them.

Depletion of Public Health Infrastructure

Armed conflict also undermines the very sector devoted to addressing the public health issues, whether it is attacks on hospitals and personnel and/or the migration of health care professionals. Interstate war and civil war in Iraq have contributed to the exhaustion of the public health sector. The loss of personnel and the degradation of facilities undermine one of the most important organizations to confront the cholera epidemic.

Dyer (2003) found that Iraqi hospitals were being looted, which left them without necessary medical equipment and supplies. Doctors and medical staff were arming themselves in order to guard hospitals and clinics. Some medical facilities were abandoned as the doctors and staff were trying to protect their own property and therefore unable to defend the hospitals as well. In 2009, many hospitals were still unable to receive reliable electricity and water.

The withdrawal of medical personnel confounds problems associated with disease outbreaks. Docquier, Lohest, and Marfouk (2007) explain that "brain drain," or the departure of educated individuals, is often experienced in nations such as Iraq. They also note that this departure of skilled individuals increases during times of political unrest. Often times, the most educated individuals in a society are the ones who have the resources to leave a conflict zone. Highly educated people are more likely to have connections outside of their home area, which provides them with a destination in times of crisis. They are also likely to have the financial means necessary to migrate to a safer location. Those with less education and ultimately less resources are often unable to flee their home when war reaches their doorstep. The United Nations High Commission for

Refugees (2008) reported that Iraq was the most common country of origin for asylum-seeking refugees in 2006. In 2007, there were more than 45,000 asylum seeking claims filed by Iraqis. One in six asylum requests globally were Iraqi. During 2007, when the cholera outbreak became widespread, the number of refugees seeking asylum from the armed conflict was almost double the number of those in 2006.

In Iraq, medical staff were being targeted by terrorists for kidnapping and extortion as well as being killed. These actions have caused many medical doctors and health workers to flee the country. Zarocostas (2007) claims that as many as 2,000 doctors had been killed and two million individuals had fled the country. There were 34,000 registered medical doctors in Iraq before the invasion (Cockburn 2008). After the invasion, 250 had been kidnapped, 2,000 had died, and 20,000 had left the country. Joseph Chamie, former director of the United Nations Population Division and an Iraq specialist, claimed that Iraq's health had deteriorated to a level not experienced since the 1950s (Kramer 2007). During times of conflict, such as when resource supplies are limited or cut off and clinics become short staffed or unavailable, infectious diseases such as cholera can quickly create serious problems, as has been the case in Iraq.

The trajectory of the cholera epidemic was clear from the start, leading many organizations to try to address the situation as it was developing. As the armed conflict was beginning, the Iraqi Red Crescent and UNICEF attempted to provide Iraqis with potable water (Valenciano et al. 2003). Nevertheless, the destruction associated with the war outpaced water. The conditions were made worse as the physical infrastructure was destroyed. Thus, limited resources resulted in water being supplied from contaminated rivers. The security situation prevented distribution of water treatment chemicals as well

as clean water from distant locations. A United Nations Humanitarian Situation Report (2008) described the security situation as preventing key humanitarian supplies such as medicine and clean water from reaching their intended destinations. Hospitals faced shortages of necessary medicine as well as equipment. Medical staff also reported being the targeted victims of violence. Ambulances were attacked in order to prevent medical staff from reaching hospitals and clinics. Limited access to basic medical supplies, and more importantly to clean water, was a key element in the onset of the cholera outbreaks that spread across Iraq. The epidemic only accelerated with the destruction of the physical infrastructure and the loss of health workers. These additional consequences of the war and armed conflict created the conditions for the increase in the rate of cholera.

Efforts to Prevent Cholera

Understanding these structural legacies of armed conflict and how they influence the rise of disease is important to try to diminish human suffering during war and the period that follows. Cholera can be easily treated and mortality greatly decreased if proper medical supplies are available. If a person is able to be properly rehydrated, their chance of survival is greatly increased. WHO (2008) reports that up to 80 percent of patients can be adequately treated with oral rehydration salts. Under normal conditions, remaining cases can be resolved with antibiotics and other simple medical treatments. WHO indicates that the acceptable fatality rate should not exceed 1 percent if normal conditions exist. In contrast, during times of conflict, basic medical supplies and personnel needed to treat patients are limited or nonexistent. Various components of the medical infrastructure are often directly and immediately destroyed during war. In Iraq,

hospitals and clinics have been inadvertently or intentionally targeted and damaged or destroyed. Physicians and staff have been killed, wounded, or flee the area. Health workers who have remained in the area worry about their survival. Sometimes this results in personnel not being present at work. Vital infrastructure throughout the city has been regularly looted. Given the potential threats within the country, delivery of necessary medical supplies has been sporadic at best.

In order to overcome infectious disease outbreaks, such as the cholera in Iraq, medical supplies, clean water, and trained personnel must be made available and a secure environment must be insured. WHO along with other aid organizations have put forth a great deal of resources and effort to help prevent and control disease outbreaks in areas adversely affected by conflict. Particular attention has been paid to Iraq and the suffering that has occurred there. In 2003, WHO immediately began mobilizing resources to address potential disease outbreaks and general health concerns associated with the invasion of Iraq (Valenciano et al. 2003). In April 2003, WHO sent a team of health experts to Kuwait. Within days of the start of major combat operations in Iraq, these health experts had set up a base in Basrah. The purpose of the base was to provide a central staging area to allow health workers to identify needs, maintain information systems, plan for and identify disease outbreaks, and to asses the health care needs of the population.

An important aspect of managing the health care needs of the Iraqi population centers around the military activities in the area. Without a certain level of stability, aid organizations are not able to deliver treatment and care. The coalition strategy for winning the war in Iraq includes improvement of infrastructure, training of local security

forces, and education focusing on the fundamentals of democracy in addition to traditional military operations aimed at combating insurgent activities. Chiarelli and Michaelis (2006) explain that the population in Iraq can essentially be divided into three demographics. These include anti-Iraqi forces (insurgents and terrorists), supporters of the coalition forces and provincial government, and fence-sitters who have not fully committed to one side or the other.

In order to achieve full-spectrum success, according to Chiarelli and Michaelis (2006), each of these groups must be dealt with accordingly. The fence-sitters must be persuaded to become supporters and those in opposition must be eliminated. Supporters must be trained, educated, and provided with infrastructure and government, which is necessary for a healthy society to flourish. This is done only in part by killing, capturing, or otherwise inhibiting insurgents and terrorists through traditional military means. Perhaps more important is to provide training and employment for security forces, civilian contractors, and employees who can rebuild and maintain infrastructure, and government actors to maintain legitimacy and stability.

In the short-term, victories are achieved by providing temporary solutions to infrastructure such as electricity production and distribution, reliable access to clean water, and consistent waste removal and disposal. Not only do these activities provide encouraging signs of progress that legitimize support for coalition operations, they also create the potential for significant employment opportunities. If members of the community are engaged in gainful employment, they will not only be working towards stability in the region but they will also be deterred from engaging in violent acts towards coalition forces. This is an extremely desirable outcome in that violence is decreased

while local communities are given the opportunity to build and the potential to flourish. Success is then maintained by insuring that the temporary solutions become permanent, functioning components of the infrastructure, which can improve the health conditions of the population.

Full-Spectrum Operations theoretically helped to put an end to the cholera outbreak in Iraq. A decrease in violence allowed supplies to enter the country and be distributed as well as medical professionals to be able to practice and provide necessary treatment and preventative efforts. Less violence also means more human capital being devoted to construction rather than destruction. Improved infrastructure such as water treatment plants, electrical generation operations, and waste removal and treatment systems will decrease the spread and occurrence of cholera.

In 2009, contaminated water was still taking a toll on the Iraqi population. Diarrheal diseases such as cholera were one of two main causes of death for Iraqi children (United Nations 2009). Additionally, 80 percent of those living outside of Baghdad did not have access to functioning sewage facilities. Less than 20 percent of the sewage in Iraq is treated before it is dumped into rivers such as the Tigris and Euphrates, which flow through the nation's capital. The United Nations and many other organizations are focusing large amounts of their efforts on water projects throughout the country.

As of March 2009, there were 35 new water treatment facilities under construction in Iraq (Department of Defense 2009). Many of the projects were over budget and behind schedule (SIGIR 2008a). Sustainability is a key issue among many of the major water projects in Iraq. Some of the plants that have been or are being built do

not have contracts for future fuel supplies. There is concern that adequate amounts of fuel will not be made available in order to operate the newly constructed facilities (SIGIR 2008b). It will be up to the Iraqi government to ensure a reliable supply of fuels in the future. The legacy of armed conflict is ever present, dramatically influencing the structural conditions that affect the cholera epidemic.

Conclusion

In this chapter, I provided an assessment of the adverse effects violent conflict has on physical infrastructure, health care systems, and resource supplies, which in turn lead to destructive health outcomes. Specifically, contaminated water and limited access to medical personnel and supplies led to an outbreak of cholera in Iraq. Predictions about the human cost of war in the Middle East were expressed at the end of the 1991 Gulf War. As resolved by the World Council of Health Worker Organizations for Social Well-Being, Health, and Peace:

> The Gulf war has demonstrated the terrifying nature of modern methods of destruction. Whole cities can be wiped out in a matter of days. People can be destroyed in hundreds of thousands by invisible air armadas; ecological catastrophes can lay waste entire regions; epidemics, famine, and forced migrations of entire populations can result. Nor do such wars solve any problems; they lay the basis for future, even more destructive wars. (Coordinating Committee 1993: 73)

Sociological analyses that address the structural changes that arise from armed conflict and that consider the direct and indirect health effects of war reveal a more comprehensive assessment of the social costs of war. This assessment reveals the conditions that contribute to the cholera epidemic and the areas that need to be addressed to prevent needless deaths from cholera. As part of my analysis related to the degradation

of the physical and social infrastructure, I discuss how local civilians, health workers, children, and populations in general experience the severe indirect consequences of armed conflict. A better understanding of the indirect effects of war would be very beneficial to the lives of civilians, those who arguably suffer the most during armed conflict.

CHAPTER IV

DISCUSSION AND CONCLUSION

Limitations

There are a number of important limitations that need to be highlighted to conclude this dissertation. Perhaps the most important focuses on data quality and availability. Many nations that bear the brunt of armed conflict have depleted infrastructure and diminished social capital, even before violence presents itself. This reality exacerbates the ability to measure and track a variety of experiences, including health outcomes. During times of conflict, it becomes even more difficult to keep records and to accurately account for death and disease. Data that do exist are not likely to capture the full extent of what happens during devastating events. It is also difficult to parse out the exact causes of particular health outcomes occurring years down the road. Because much of the burden of war has been shown to be borne much later after the conflict has ended, it is very difficult to measure the structural causes of issues such as increased morbidity and mortality.

Another difficulty associated with relevant data is that they are rarely consistent across country and over time. Causes of death are often coded and recorded differently within different health care systems. Not only are data inconsistent across broad systematic information systems, it can be difficult to maintain consistency on local levels.

For example, if someone suffers a heart attack as a result of cardiovascular disease while driving a car, and as a result dies in a car accident, it is entirely possible that the cause of death will be recorded as vehicle accident and not heart-health related. Measuring health outcomes during and after war is confounded by a number of factors including pressure for governing bodies to bias the data in favor of telling "their side of the story." This assumes that the ability to record and organize data exist at all. Most of the global data that exist are compiled by international organizations such as the World Health Organization. Often times the WHO simply acquires data from national statistical registries. It is understood that these data are more often than not sparse and only capturing a small snapshot of the realities on the ground.

A number of studies have explored the effects of limited access to food and supplies as a result of war. Such studies have shown that child malnutrition rates are quickly increased as a result of armed conflict (Carlton-Ford 2004). Cardiovascular disease has also been shown to be linked to the stresses experienced in war (Fitzpatrick et al. 2004; Poole 2012). "Brain drain," or the departure of educated individuals, is often experienced in nations experiencing armed conflict. Often times the most educated individuals in a society are the ones who have the resources to leave a conflict zone. Highly educated people may have connections outside of their home area that can provide them with a destination in times of crisis. They are also likely to have the financial means necessary to migrate to a safer location. Those with less education and ultimately less resources are often unable to flee their home when war reaches their doorstep (Docquier, Lohest, and Marfouk 2007). All of these factors can have devastating effects on the overall health and well-being of civilian populations. These factors

demonstrate the compounding difficulty of making connections between macro forces, such as regional armed conflict, and individual level experiences, such as death and disease.

A significant limitation of the literature is that very few studies have conducted longitudinal, cross-national research. Broad comparisons will be important to make in order to better understand the patterns that consistently emerge. Focusing on a variety of causes and consequences will be important. It is not often obvious that connections exist between forces like widespread violence, and the fear of violence, and specific outcomes such as negative health impacts.

Considerations for Future Research

Further research is needed in order to better understand all of the mechanisms associated with war-related health outcomes. Future should also investigate the effects of a wide variety of chronic and infectious diseases, which have been historically understudied by social scientists, in order to paint a more comprehensive picture and formulate better understanding of the relationship between war and health.

Specifically, further research should directly explore ways in which armed conflict impacts disease outbreak and occurrence. For example, additional insight may be gained by further examining specific historical conflicts in order to understand the mechanisms that influenced rates of morbidity and mortality. If we are able to better understand the mechanisms such as depleted resources and damaged infrastructure that cause increases in disease, disability, and death, many lives could be improved and saved. Policy makers, citizens, and leaders who make the critical decisions of when to engage in

armed conflict, when to exit, and how to cope with the aftermath need to be as informed and educated as possible regarding the potential outcomes and ultimately the human costs of war.

In order to move forward, new data will need to be collected in order to fully understand the relationship between armed conflict and health. The limited data that are currently available typically only extend through the Cold War period (see Gleditsch et al. 2002 and Lacina and Gleditsch 2005). As the Global War on Terror stretches in to its second decade, it will be important for researchers to construct comprehensive databases which will allow the study of wars in the Middle East, eastern Africa, and elsewhere. Technological advances are making data accumulation, storage, and distribution more widely available, accessible, and creditable. Innovative and creative ways of measuring infrastructure depletion, information system break downs, population movement, and health outcomes will be necessary to better understand the causal mechanisms of war on health outcomes. It will be important to examine the long-term effects of conflict on mortality and morbidity after years have passed and data become available.

Additional data measuring cause specific mortality, and also measures of injury and morbidity, will be very beneficial. There are many psychological and physical effects of armed conflict that have been understudied by social scientists and those working to better understand war in general. Significant changes in populations may disrupt economies; shift global, regional, and local power balances; impact numerous health outcomes; and directly change the trajectory of the human experience as a whole. Social scientists are positioned to help create a better understanding of all of these relationships. Breaking death counts into quintiles may also prove to be beneficial in further analyses.

This will help to exemplify the true effect of varying intensity and duration levels of armed conflict.

Measures of military expenditure as a percentage of GDP and military expenditure per soldier would also be helpful variables to consider in future research. These measures help to capture the extent to which a country devotes resources to military capabilities in comparison to other social and/or economic opportunities. The "guns or butter" debate essentially suggests that a country has the choice between allocating resources to benefit economic growth and human welfare or military capabilities (Kourvetaris 1991). By including measures of military expenditure, future research will be able to account for differences between countries who tend to devote more resources to military capabilities, thereby increasing the likelihood that these capabilities will be used to engage in armed conflict (Kentor and Kick 2008). If a nation's resources are being directed to military capacity, they cannot be allocated to health care and other civilian/economic investments. This further exacerbates the impact of armed conflict as the intervening mechanisms (increased GDP, investment in health care infrastructure, etc.) are diminished.

Future research should also consider regional variation across the globe. This could be done by coding regional and subregional measures of geographic locations. Tropical regions experience greater risk for infectious diseases such as cholera and malaria. Geography is important not only for environmental factors, but political as well. The Middle East experiences different threats and experiences of armed conflict than North America, for example. Historically there have been patterns of conflict centralized in regional locations, such as the Middle East. If data are made available that make it

possible to explore in detail the impact of conflict on regions of the globe, a better understanding of these relationships is likely to result.

Collaboration between public health experts, political scientists, and sociologists will be necessary in order to achieve a comprehensive understanding of the causes and consequences of armed conflict in relation to the health of populations. This comprehensive approach should also include an analysis of the intensity and duration of each conflict as well as varying types of conflict such as civil wars, wars fought between nations on foreign soil and within their own boarders, surrogate wars fueled by outside actors and conducted on foreign soil, and so forth. As war has moved away from mass armies engaged in large-scale combat, and urban warfare exhibiting insurgent tactics becomes the norm, empirical investigations will need to be adaptive and flexible in order to reflect the shifting realities. The future of social scientific studies of war and health is very promising. Many questions remained unanswered, but research agendas in this field of study appear to be gaining momentum as the general public begins to become more cognizant of health patterns.

In addition, further research should investigate the effects of a wide variety of chronic and infectious diseases that have not been explored in any detail by social scientists in order to paint a more comprehensive picture and formulate better understanding of the relationship between war and health. As these mechanisms are better understood and exhibited in the literature, future studies will be able to continue the process of making connections between factors that have otherwise seemed unrelated.

If we look at historical patterns, it is unrealistic to assume that armed conflict will be decreasing or becoming a things of the past. The United States, for example, has been

engaged in active combat missions for 223 out of the 240 years that it has existed as a country (Danios 2015). The current Global War on Terror is not showing any promise of immediate resolution, and mass disruption to populations and economies is currently setting the stage for factors that have historically been associated with the emergence of further armed conflict. During times of conflict when resource supplies are limited or cut off and clinics become short staffed or unavailable, infectious diseases can quickly create serious problems. This is especially true when large numbers of individuals are displaced and relocated into refugee camps, where there is often limited access to clean water and sanitation services, while living with very high population density. These conditions create the perfect environment for the rapid spread of infectious diseases. This in turn can diminish economies and social structures, resulting in greater likelihood of broad conflict.

The current armed conflicts in Iraq and Syria, and subsequent mass-migrations, provide a valuable example that should be carefully studied in order to better understand the indirect health effects of war. The Syrian example in particular demonstrates the increased level of conflict intensity now being experienced by large populations. Armed conflict in Syria has resulted in the largest mass-migration of people in recorded history. This displacement will impact economies and societal relationships across the globe. Exactly what these impacts will be, and the intensity of the effect, will only be understood with passing time. Regardless, active efforts to compile extensive quantitative data, as well as rich qualitative research, will prove to be very important in order to better create policy and understand the experience in general moving forward. There is now an opportunity to design and initiate longitudinal studies of populations affected by these conflicts. These studies can focus attention on tracking and evaluating indirect health

consequences as they emerge over time. These preemptive studies may prove to be useful not only to the individuals directly affected, but to society as whole as we better understand armed conflict and the true human costs that it demands.

Similarly, there is a tremendous potential to study indirect health effects of war by focusing on veterans of war. The United States has seen high (and in many cases increasing) rates of suicide, homelessness, unemployment, under-employment, and other negative experiences among veterans of American wars. It appears that there is a widening gap between civilian and military individuals in American society, and this further confounds social-psychological as well as physical well-being within veteran populations (Johnston and Poole 2015). Exploring the causes and consequences of armed conflict involvement on veteran health and well-being is another important aspect in understanding the total human cost of war.

In this dissertation, I have elucidated a few of the many complex issues regarding indirect health consequences of violent conflict. With more sociological and epidemiological exploration, researchers will be able to move the field forward, providing valuable information to military, government, NGOs, and other influential organizations. Ideally, this information will be used to strengthen diplomacy and, when the need arises, refine armed conflict to be as effective as possible while minimizing the far-reaching devastation on innocent populations.

It is very important for relief programs to focus on health issues centered around food, water, and sanitation in order to prevent excessive morbidity and mortality associated with war. Social scientists collaborating with public health experts will be able to provide insightful new methods of measurement resulting in better ways to predict and

prevent the devastating health consequences of war on populations around the globe. A better understanding of the complete human costs of war will allow those with control over the matter to weigh the consequences over the benefits associated with war. While it is unrealistic to simply say that we should end violent conflicts, it is extremely important to refine our knowledge and understanding of armed conflicts in order to develop better methods of preventing, engaging in, and ultimately minimizing the devastation of war.

APPENDIX

Descriptive Statistics

Table 5 Female Cardiovascular Disease Age 15-64

Variable	N	Mean	Std. Dev.	Min.	Max.
Female Mortality	4138	0.5563	0.4714	0	16.03
War Dummy	3143	0.1667	0.3728	0	1
War Count	3143	0.2119	0.5234	0	4
Interstate Dummy	3143	0.0372	0.1893	0	1
Interstate History	3143	6.3144	12.166	0	57.14
Intrastate Dummy	3143	0.1298	0.3362	0	1
Intrastate History	3143	9.1356	19.218	0	100
Minor Dummy	3143	0.0869	0.2817	0	1
Minor History	3143	6.7671	15.287	0	100
Severe Dummy	3143	0.0799	0.2711	0	1
Severe History	3143	9.8990	17.519	0	100
Democracy	2702	3.4811	7.3424	-10	10
Tropical	4235	0.3530	0.4780	0	1
Urban Growth	4175	2.2030	1.9411	-44.16	19.29
Hospital Beds	1009	7.8340	7.1558	0.33	89.55
Age Dependency Ratio	3860	0.6482	0.1738	0.36	1.14
Health Expenditure	789	681.06	925.76	0	4271
Year	4235	1981	12.42	1960	2000
GDP	2321	8.827	0.8804	6.46	10.82

Table 6 Male Cardiovascular Disease Age 15-64

Variable	N	Mean	Std. Dev.	Min.	Max.
Female Mortality	4143	1.1989	0.8671	0	17.78
War Dummy	3196	0.1696	0.3753	0	1
War Count	3196	0.2150	0.5252	0	4
Interstate Dummy	3196	0.0369	0.1886	0	1
Interstate History	3196	6.4133	12.169	0	57.14
Intrastate Dummy	3196	0.1330	0.3396	0	1
Intrastate History	3196	9.2520	19.142	0	100
Minor Dummy	3196	0.0864	0.2809	0	1
Minor History	3196	6.7147	15.170	0	100
Severe Dummy	3196	0.0832	0.2763	0	1
Severe History	3196	10.1100	17.587	0	100
Democracy	2676	3.5277	7.3239	-10	10
Tropical	4241	0.3525	0.4778	0	1
Urban Growth	4175	2.2030	1.9411	-44.16	19.29
Hospital Beds	1009	7.8340	7.1558	0.33	89.55
Age Dependency Ratio	3860	0.6482	0.1738	0.36	1.14
Health Expenditure	789	681.06	925.76	0	4271
Year	4235	1981	12.42	1960	2000
GDP	2321	8.83	0.88	6.47	10.82

List of Countries

Albania
Antigua and Barbuda
Argentina
Armenia
Australia
Austria
Azerbaijan
Bahamas, The
Bahrain
Barbados
Belarus
Belgium
Belize
Bosnia and Herzegovina
Brazil
Bulgaria
Canada
Chile
Colombia
Costa Rica
Croatia
Cuba
Czech Republic
Denmark
Dominica
Dominican Republic
Ecuador
Egypt
El Salvador
Estonia
Fiji
Finland
France
Georgia
Greece
Grenada
Guatemala
Guyana
Honduras
Hungary
Iceland
Ireland
Israel
Italy
Jamaica
Japan
Kazakhstan
Korea, Rep.
Kuwait
Kyrgyz Republic
Latvia
Lithuania
Luxembourg
Macedonia, FYR
Malta
Mauritius
Mexico
Moldova
Netherlands
New Zealand
Nicaragua
Norway
Panama
Papua New Guinea
Paraguay
Peru
Philippines
Poland
Romania
Russian Federation
Sao Tome and Principe
Seychelles
Singapore
Slovak Republic
Slovenia
Spain
Sri Lanka
St. Kitts and Nevis
St. Lucia
St. Vincent and the Grenadines
Suriname
Sweden
Switzerland
Syrian Arab Republic
Tajikistan
Thailand
Trinidad and Tobago
Turkmenistan
Ukraine
United Kingdom
United States
Uruguay
Uzbekistan
Venezuela, RB
Yugoslavia, Fed. Rep.

REFERENCES

Ashford, Mary-Wynne and Yolanda Huet-Vaughn. 2000. “The Impact of War on Women.” Pp. 186-196 in *War and Public Health*, edited by B. S. Levy and V. W. Sidel. Washington D.C.: American Public Health Association.

Al Jazeera. 2008. "Cholera Outbreak Spreads in Iraq." *Al Jazeera*. Online. Retrieved 7/27/09 (http://english.aljazeera.net/news/middleeast/2008/09/200891113412105764.html).

Basoglu, Metin, Livanou, Maria, Crnobaric, Cvetana, Franciskovic, Tanja, Suljic, Enra, Duric, Dijana, and Vranesic, Melin. 2005. “Psychiatric and Cognitive Effects of War in Former Yugoslavia: Association of Lack of Redress for Trauma and Posttraumatic Stress Reactions.” *JAMA: Journal of the American Medical Association,* 294(5):580-590.

Brenner, Harvey M., 1973. *Mental Illness and the Economy*. Cambridge, MA: Harvard University Press.

Brenner, Harvey M. and Annie Mooney, 1983. "Unemployment and Health in the Context of Economic Change." *Social Science and Medicine* 17(16):1125-1138.

Bunton, Robin, and Jane Wills. 2005. "War and Public Health." *Critical Public Health* 15(2):79-81.

Carlton-Ford, Steve. 2004. "Armed Conflict and Children's Life Chances." *Peace Review* 16(2):185-191.

Carlton-Ford, Steve, Morten G. Ender, and Ahoo Tabatabai. 2008. "Iraqi Adolescents: Self-regard, Self-derogation, and Perceived Threat in War." *Journal of Adolescence* 31(1):53-75.

Chiarelli, P. W., and Michaelis, P. R. 2006. "Winning The Peace: The Requirement for Full-Spectrum Operations." *Military Review* 85(4):4-17.

Cliff, J., and A. R. Noormahomed. 1993. "The Impact of War on Children's Health in Mozambique." *Social Science & Medicine* 36(7):843-848.

Cockburn, Patrick. 2008. "Corruption Blamed as Cholera Rips Through Iraq." *The Independent*. Online. Retrieved 7/27/09 from <http://www.independent.co.uk/news/world/middle-east/corruption-blamed-as-cholera-rips-through-iraq-956701.html>.

Coordinating Committee, World Council of Health Worker Organizations for Social Well-Being, Health and Peace. 1993. "Regional Conflicts and Their Threat to World Peace." *Journal of Public Health Policy* 14(1):93-94.

Danios. 2015. Washingtonsblog.com. "American Has Been at War 93% of the Time - 222 Out of 239 Years - Since 1776." Online. Retrieved 3/27/2016 from *<http://www.washingtonsblog.com/2015/02/america-war-93-time-222-239-years-since-1776.html>.*

Department of Defense. 2009. Measuring Stability and Security in Iraq. *Report to Congress in Accordance with the Department of Defense Supplemental Appropriations Act 2008*. Section 9204, Public Law 110-252.

Docquier, Frederic, Olivier Lohest, and Abdeslam Marfouk. 2007. "Brain Drain in Developing Countries." *World Bank Economic Review* 21(2):193-218.

Dyer, Owen. 2003. "Doctors Forced to Guard Baghdad Hospitals After Looting." *BMJ: British Medical Journal* 326(7394):837.

Falger, P. R. J., W. Op den Velde, J. E. Hovens, E. G. W. Schouten, J. H. M. De Groen, and H. Van Duijn. 1992. "Current Posttraumatic Stress Disorder and Cardiovascular Disease Risk Factors in Dutch Resistance Veterans from World War II." *Psychother Psychosom* 57(4):164-171.

Fitzpatrick, A. L., T. Reed, J. Goldberg, and D. Buchwald. 2004. "The Association Between Prolonged Fatigue and Cardiovascular Disease in World War II Veteran Twins." *Twin Research: The Official Journal Of The International Society For Twin Studies* 7(6):571-577.

Garfield, Richard. 1985. "Health Consequences of War in Nicaragua." *The Lancet* 326(8451):392-392.

Garfield, R. M., E. Prado, J. R. Gates, and S. H. Vermund. 1989. "Malaria in Nicaragua: Community-Based Control Efforts and the Impact of War." *International Journal Of Epidemiology* 18(2):434-439.

Ghobarah, Hazem Adam, Paul Huth, and Bruce Russett. 2003. "Civil Wars Kill and Maim People - Long After the Shooting Stops." *American Political Science Review* 97(2):189-202.

Gleditsch, Nils Petter, Peter Wallensteen, Mikael Eriksson, Margareta Sollenberg, and

Havard Strand. 2002. "Armed Conflict 1946-2001: A New Dataset." *Journal of Peace Research* 39(5):615-637.

Hacaoglu, S. 2008. Iraq Suffers From Dirty Water, Fear About Cholera. *The Huffington Post*. Online. Retrieved 7/27/09 from <http://www.huffingtonpost.com/2008/08/01/iraq-suffers-from-dirty-w_n_116473.html?view=screen>.

Head, R. F., M. S. Gilthorpe, A. Byrom, and G. T. Ellison. 2008. "Cardiovascular Disease in a Cohort Exposed to the 1940-45 Channel Islands Occupation." *BMC Public Health* 8(303):1-10.

Hill, J. 1942. *Silent Enemies: The Story of the Diseases of War and their Control*. New York: G.P. Putnam and Sons.

Iacopino, Vincent, and Ronald J. Waldman. 1999. "War and Health: From Solferino to Kosovo--The Evolving Role of Physicians." *JAMA: Journal of the American Medical Association* 282(2):479-481.

Jansen, Golie G. 2006. "Gender and War: The Effects of Armed Conflict on Women's Health and Mental Health." *Affilia: Journal of Women & Social Work* 21(2):134-145.

Johnston, Roger and Daniel Poole. 2013. "Fulfilling the Social Contract: Conflict Between Society and Combat Veterans." *Proceedings of the Utah Acedemy of Sciences, Arts, & Letters*.

Kang, Han K., Tim A. Bullman, and Judith W. Taylor. 2006. "Risk of Selected Cardiovascular Diseases and Posttraumatic Stress Disorder among Former World War II Prisoners of War." *Annals of Epidemiology* 16(5):381-386.

Kentor, Jeffrey and Edward Kick. 2008. "Bringing the Military Back In: Military Expenditures and Economic Growth 1990 to 2003". *Journal of World-Systems Research* 14(2):142-172.

Kourvetaris, George A. 1991. "Beyond the Arms Race: The Search for a New Paradigm of a Peaceful World." *Journal of Political and Military Sociology* 19(2):233-252.

Kramer, Andrew E. 2007. "Cases of Cholera Reach Baghdad." *The New York Times*. Online. Retrieved 7/27/09 from <http://www.nytimes.com/2007/09/21/world/middleeast/21iraq.html>.

Kratovac, Katarina. 2007. "Cholera Spreads to Iraq's Southernmost City, Officials Concerned About Shortage of Chlorine." *North County Times*. Online. Retrieved 3/27/09 from <http://www.nctimes.com/articles/2007/09/22/news/nation/18_25_079_21_07.txt

>.

Kubzansky, Laura D., Ichiro Kawachi, Scott T. Weiss, and David Sparrow. 1998. "Anxiety and Coronary Heart Disease: A Synthesis of Epidemiological, Psychological, and Experimental Evidence." *Annals of Behavioral Medicine* 20(2):47-58.

Lacina, Bethany, and Nils Gleditsch. 2005. "Monitoring trends in global combat: A new dataset of battle deaths." *European Journal of Population* 21(2):145-166.

Levy, Barry S., and Victor W. Sidel. 2000. "The Impact of Military Activities on Civilian Populations." Pp. 149-167 in *War and Public Health*, edited by B. S. Levy and V. W. Sidel. Washington D.C.: American Public Health Association.

Levy, Barry S., and Victor W. Sidel. 2003. "War, Terrorism, and Public Health." *Journal of Law, Medicine & Ethics* 31(2003):516-523.

Levy, Barry S., and Victor W. Sidel. 2009. "Health Effects of Combat: A Life-Course Perspective." *Annual Review Of Public Health* 30(1):123-136.

Li, Quan, and Ming Wen. 2005. "The Immediate and Lingering Effects of Armed Conflict on Adult Mortality: A Time-Series Cross-National Analysis." *Journal of Peace Research* 42(4):471-492.

Massey, Douglas S., Jorge Durand, and Nolan J. Malone. 2002. *Beyond Smoke and Mirrors: Mexican Immigration in an Era of Economic Integration*. New York: Russell Sage Foundation.

Mathers, Colin D., Ritu Sadana, Joshua A. Salomon, Christopher J. L. Murray, and Alan D. Lopez. 2001. "Healthy Life Expectancy in 191 Countries, 1999." *Lancet* 357:1685-1692.

Murray, C. J. L., G. King, A. D. Lopez, N. Tomijima, and E. G. Krug. 2002. "Armed Conflict as a Public Health Problem." *British Medial Journal* 324(7333):346-349.

Murray, Christopher J.L., and Alan D. Lopez. 1997. "Alternative Projections of Mortality and Disability by Cause 1990-2020: Global Burden of Disease Study." *The Lancet* 349(9064):1498-1504.

Murthy, R. Srinivasa. and Rashmi Lakshminarayana. 2006. "Mental Health Consequences of War: A Brief Review of Research Findings." *World Psychiatry: Official Journal Of The World Psychiatric Association (WPA)* 5(1):25-30.

Pilay, Aida, Aulikki Nissinen, Ari Haukkala, Dragana Niksic, Tiina Laatikainen. 2007. "Cardiovascular Risk Factors in the Federation of Bosnia and Herzegovina." *European Journal of Public Health* 17(1):75-79.

Poole, Daniel. 2012. “Indirect Health Consequences of War: Cardiovascular Disease.” *International Journal of Sociology 42(2):90-107*.

Prinzing, Friedrich. 1916. *Epidemics Resulting from Wars*. Oxford: Clarendon Press.

Przeworski, Adam, Michael Alvarez, Jose Antonio Cheibub, and Fernando Limongi. 2000. *Democracy and Development: Political Institutions and Well-Being in the World, 1950-1990*. Cambridge: Cambridge University Press.

Reuveny, Rafael, and Quan Li. 2003. "Economic Openness, Democracy and Income Inequality: An Empirical Analysis." *Comparative Political Studies* 36(5):575-601.

Rose, H. G., P. Schweitzer, V. Charoenkul, and E. Schwartz. 1987. "Cardiovascular Disease Risk Factors in Combat Veterans After Traumatic Leg Amputations." *Archives of Physical Medicine and Rehabilitation* 68(1):20-3.

Sibai, Abla M., Astrid Fletcher, and Haroutune K. Armenian. 2001. "Variations in the Impact of Long-Term Wartime Stressors on Mortality Among the Middle-Aged and Older Population in Beirut, Lebanon, 1983-1993." *American Journal of Epidemiology* 154(2):128-137.

SIGIR. 2008a. Office of the Special Inspector General For Iraq Reconstruction. "*Sadr City R3 Water Treatment Plant Baghdad, Iraq*." SIGR PA-08-143.

SIGIR. 2008b. Office of the Special Inspector General For Iraq Reconstruction. "*Al Kazim Water Supply Nassriya, Iraq*." SIGIR PA-08-125.

Smallman-Raynor, M., and A. D. Cliff. 2000. "The Epidemiological Legacy of War: The Philippine-American War and the Diffusion of Cholera in Batangas and La Laguna, South-West Luzin, 1902-1904." *War in History* 7(1):29-64.

Swiss, Shana and Joan E. Giller. 1993. “Rape as a Crime of War; A Medical Perspective.” *Journal of the American Medical Association* 270(5):612-615.

United Nations Children’s Fund. 1994. *The State of the World’s Children*. New York: Oxford University Press.

United Nations. 2008. "Humanitarian Situation Report: Baghdad, Basrah, Wassit and Babylon." Online. Retrieved 11/27/09 from <http://www.unhcr.org/refworld/docid/488d7d9e2.html>.

United Nations High Commission for Refugees. 2008. "Asylum Levels and Trends in Industrialized Countries, 2007." Online. Retrieved 7/27/09, from <http://www.unhcr.org/statistics/STATISTICS/47daae862.pdf>.

United Nations. 2009. "Humanitarian Update No. 5." Online. Retrieved 12/3/09 from <http://ochaonline.un.org/OchaLinkClick.aspx?link=ocha&docId=1109728>.

Valenciano, Marta, Denis Coulombier, Barbara Lopes Cardozo, Alessandro Colombo, Mouhsen Jar Alla, Samuel Samson, and Maire A. Connolly. 2003. "Challenges for Communicable Disease Surveillance and Control in Southern Iraq." *JAMA: The Journal Of The American Medical Association* 290(5):654-658.

Westing, Arthur H. 1981. "Crop Destruction as a Means of War." *Bulletin of Atomic Scientists* 37(2):38-42.

Wilkinson, Richard G. 1996. *Unhealthy Societies: The Afflictions of Inequality*. London: Routledge.

World Health Organization. 2003. "Cholera in Iraq" Online. Retrieved 5/12/09, from <http://www.who.int/csr/don/2003_05_08a/en/index.html>.

World Health Organization. 2007. "Cholera, Iraq - Update." *Weekly Epidemiological Record* 82(41):357-358.

World Health Organization. 2008. "Fact Sheet No. 107: Cholera." Online. Retrieved 5/12/09, from <http://www.who.int/mediacentre/factsheets/fs107/en/print.html>.

World Health Organization. 2008. "The World Health Organization's Mortality Database" Online. Retrieved 5/12/09, from *<http://www.ciesin.org/IC/who/MortalityDatabase.html>*.

Zarocostas, John. 2007. "Exodus of Medical Staff Strains Iraq's Health." *BMJ: British Medical Journal* 334(7599):865.